IVAN EFREMOV'S THEORY OF SOVIET SCIENCE FICTION

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ABSTRACT

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By

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This study analyzes specific principles of Ivan Efremov's theoretical and artistic writing which contributed to the foundation of modern Soviet science fiction, especially its use of scientific and technological material. Efremov's ideas for developing methods of forecasting and for projecting man's psycho-social history into the future are described. His devices for incorporating scientific material in literature are discussed in terms of "scientific license" and are classified as "theoretical," "operational," and "descriptive."

Efremov's criticism of the implications of Darwinian and Freudian principles which inspire anti-Utopian themes in contemporary science fiction are examined and compared with his own principles of "sociological evolution" (Noosphere) and psychology of "impulsive flashes" supported by a "philosophical purport." In the process of creating his characters, Efremov projects the

traits of those contemporary types who most closely approximate the character models of the future. They are characters who are products of a centuries old Communist planetary society and are differentiated by their genetic-psychological qualities.

An evaluation of Efremov's creative strategies is undertaken on the following levels: (1) the scientific, probing the methods of forecasting; (2) the philosophic, examining the construction of social and psychological models; and (3) the artistic, dealing with the verisimilitude and psychological complexity of dramatization.

Efremov's reintroduction of the utopian novel coincides with the appearance of the concept of Utopia in such expanding fields of creativity as futurology and systems analysis. The probing of all aspects of the utopian content becomes a natural task for the science fiction genre. The findings in this study show that Efremov was fully aware of the significance of this task and that he proceeded, within the boundaries of Communist ideology, to depict future technology in sociologically and philosophically meaningful terms. Perhaps in order to rectify some of the distortions or oversimplifications for which one might blame even such modern utopists as Efremov, other avenues of scientific thinking, e.g., cybernetics, should be explored to lend new logical rigor, systems, and psychological models for creative literary

content. Nevertheless, Efremov's insistence on fathoming the future as a whole system is a significant step away from primitive depictions of Utopia.

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To my parents, and to Svetlana

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INTRODUCTION

The last third of the twentieth century is about to bring significant changes in everyone's life here on Earth. Just to consider two well-established indicies: with regard to population explosion, for example, a world totally new and different from our existing one will have to be built within the next thirty-five years;[1] in terms of scientists, ninety percent of all the scientists who ever lived are living now.[2] One cannot avoid being aware of the consequences and the extent to which change occurs almost everywhere.

Today the number of professionals engaged in exploring the future is probably as great as that of those exploring the past.[3] Forecasters and prophets have always existed, but it is more accurate to trace the pioneers in the contemporary futures research and the technological forecasting institutes to utopian novelists and science fiction writers.[4] Science fiction, as this literature has loosely been called, has multiplied in both quantity and quality over the past fifty years. Its repertoire now ranges from science adventure stories to deep

philosophical and social novels. It is only since the 1950's, however, that the genre has begun to receive growing attention and recognition as something more than an extravaganza of fantasies written for the young (at heart).

The nature of science fiction is quite unique. As the world has become complicated, more mobile, and much more difficult to portray in conventional literature, science fiction has been introduced into the realm of artistic literature by a completely new breed of writers--astronomers, physicists, bio-chemists, engineers, medical doctors and others, as well as numerous amateurs in these fields. Science has its own language, a language which is not always understandable to the layman who wishes to understand it. Since science fiction is the one medium which introduces and develops new concepts, new symbols, and new ideas, the reader of science fiction begins to use that language and think in those terms.

Proof of the effectiveness of science fiction can also be found in the feedback, though somewhat one-sided at this time, between Western and Soviet science fiction. A dialogue on the essentials of science fiction writing exists exclusive of other levels of artistic communication, exclusive of the known efforts of "cultural exchange" between America and the U.S.S.R. With such subjects as international conditions, Space exploration, ecology, man

and machine, sociology, etc., science fiction gives a point of reference to the pressing world problems common to all humanity. This typifies Ivan Antonovic Efremov, whose first novel gives an alternative to "anti-humanism," to the "monotony of themes about mankind's destruction through annihilating wars [as depicted in Western science fiction]."[5] Efremov was motivated by the desire to build instead a "friendly contact between various civilizations."[6]

Actually Western science fiction has not done so well with serious utopian novels since H. G. Well's The Modern Utopia and Men Like Gods. Instead, the antiutopian themes have been much more predominant. The utopian blueprints, although requiring more imagination to write, do not always appear to be desirable enough for people to try to build one. Rather, Zamjatin, Huxley, Orwell, and Forster picture the ease with which it is possible to fall into a pseudo-utopia, thus rendering the reader more cautious about each step in his enthusiasm to create utopias.

Efremov takes up the technological utopian theme where Western science fiction has stopped. He combines science fiction with youthful Marxian humanism for the purpose of introducing guidelines for creating flexible utopias and providing a firm foundation for the new genre in order that it might hold a respectable position among

the "serious" forms of artistic literature. These two intentions have forced Efremov into an ambitious undertaking.

In the Soviet Union, science fiction is disseminated in thousands of publications a year. According to Soviet library statistics, every fourth person reads science fiction.[7] Numerous articles appear in the main Soviet newspaper discussing the problems and theories of writing science fiction. During 1969 and 1970 Literaturnaja gazeta reserved pages for such discussions and comments from laymen[8] both inside and outside the country and from a good number of professional science fiction writers and critics.[9]

My purpose here is to produce an analytical representation of Efremov's stated creative methods and practices, subjecting them to analysis based on the criteria of contemporary data in the fields that Efremov used to justify his principles for writing Soviet science fiction. In this manner I will endeavor to define Efremov's conceptual limitations in terms of known possibilities of the genre. Efremov represents one of the most prolific Soviet science fiction writers, but for thirty years he has exerted a decisive influence in the U.S.S.R., and contributed to the dialogue with Western science fiction.[10]

A more complete biography of Efremov may be found in an appendix to his collection Velikaja Duga.[11]

Ivan Efremov was born in 1907. When the civil war broke out, he was in the southern part of the Ukraine finishing the equivalent of the third year of high school. He joined the Sixth Mechanized Army Company with the Red Army and spent some time on the coast of the Azov and Black Seas until he received a concussion. As a result of this accident, he temporarily lost his power of speech. In Leningrad after the civil war, Efremov enrolled in a correspondence course in the naval school and worked part-time as a truck-driver's assistant. He received his degree in 1922.

In the same year, influenced by a Pravda article on paleontology written by the eminent scholar P. P. Suškin, Efremov wrote to Suškin and received an invitation to visit the Academy of Sciences. Toward the end of the five-year plan (1933), Efremov returns to continue the late Suškin's work. But prior to this academic position, Efremov travelled as an apprentice seaman in the Far East and on the Caspian Sea. But later he returned to Leningrad to continue his studies, leaving seamanship for the summer season only.

Efremov received his diploma from the Leningrad Gornyj Institut in 1930. His degree work discussed the possibility of retrieving culinary roots from the ocean bed rock. The plan was rejected for its impracticality.

After beginning Professor Suškin's work, Efremov received the equivalent of an M.Sc. and later a Ph.D. in 1940. In the late 1940's Efremov embarked on numerous paleontological expeditions which took him tens of thousands of kilometers into the interior of Siberia, Yakutsk, the Urals, the Far East, the Central Asia and Middle East, Sachalin, Western China, and Mongolia, where he discovered "cemeteries of Dinosaurs," pantry gold, ancient mines, and foresaw diamonds. In Tafonomia and The Geological Writing, Efremov developed a new branch of paleontology called "Tafonomia," which dealt with the boundary between biology and geology, the science of the condition of buried animal remains. This work was not published until 1951.

In 1942, Efremov made his first attempts at writing about scientific explorations: Vstrèča nad Tuskaroroj (Meeting Over the Tuscarora), Katti-Sark, Ozero Gornyx Duxov (The Lake of the Mountain Spirits), Putjami staryx gornjakov (The Ways of the Old Miners,) Olgoj-Xorxoj, Golex podlunnyj (Moon Mountain), Èllinskij sekret (The Hellenic Secret). (In 1945 these stories were translated into English.) In 1944 Efremov published another six stories: Belyj Rog (White Horn), Atoll Fakaofo, Observatorija Nur-i-Dešt (The Nur-i-Dešt Observatory), Buxta radužnyx struj (The Wave of the Rainbow Foam), Ten' minuvšego (Shadow of the Past), Poslednij marsel' (The

Last Marsel), followed later by Almaznaja truba (The Diamond Vane). In 1945 he wrote his first science fiction story (prior to this the stories were known as science adventure), Zvezdnye korabli (Stellar Ships) and in 1948 Adskoe plamja (The Hell Flame). All these works reflect Efremov's life as a paleontologist and seafarer for he writes about travelers, scientists, and explorers.

Na kraju Ojkumeny (On the Brink of the Inhabited World), his first large work on the history of ancient Greece and Egypt, appeared in 1949 and Putešestvie Baurdžeta (The Travels of Baurdžed), his second such work, in 1952. Efremov began a major science fiction novel in 1955 which was published in 1958 as Tumannost' Andromedy (The Andromeda Nebula). His third science fiction work, Cor Serpentis, was published in 1959 and his last major science fiction work, Čas Byka (The Hour of the Bull), in 1970. His experimental novel Lezvye britvy (The Edge of the Razor) appeared in 1964. Efrenov is now retired from his position in the Academy of Sciences to which he was elected in 1940.

Efremov's theory and method for writing science fiction is described in the first chapter of this study. The application of this theory and method is elaborated in terms of Efremov's own science fiction works in the following chapters. Chapter II deals with Efremov's use

of scientific and technological material[12] in artistic literature. Here I introduced and categorized a concept of "scientific license" to denote a literary device extensively used in science fiction. Chapter III discusses Efremov's criticism of contemporary anti-utopian theories and his version of the ethical, sociological, and educational role of science fiction. Chapter IV describes and criticizes Efremov's depiction of the mind, body, and behavior of man's future stages of evolution. Chapter V is my critique of scientific principles by which Efremov constructs his utopias and his future man.

The designation of a literary genre as science fiction, controversial as the term might be, is complicated by the fact that the Russian term "naučnaja fantastika" has a slightly different emphasis than its English counterpart. There is complete agreement that science plays a distinctive role. The difference arises in regard to the second term. In Russian, "fantastika" stresses the phantastic aspect of the literature, that is to say, the possibility of this phantasy becoming a reality sometime in the future. Enciklopedičeskij slovar' defines "fantastika" as "the depiction of objects or phenomena, which are sharply in contrast with existing reality. 'Fantastic' images are created from elements of actual

reality and often serve to anticipate what in the future will become reality. Examples of 'fantastic' images can be found in folklore. In Russian folklore these include the flying carpet, the "autoaxe' . . . flights through the air, and any means by which one can facilitate his work, etc."[13] H. W. Flowler makes a distinction between the English words fantasy and phantasy. The former term is said to denote caprice, whim, fanciful invention; the latter to denote an imaginative, visionary notion.[14] The latter term emphasizes imagination rather than fantasy; hence it is more concrete and more possible. Phantasy is much closer to the Russian term "fantastika." I will, therefore, use phantasy to emphasize this distinction in the Russian term for science fiction; a phantast is a writer of science fiction; phantastic works are science fiction works.

The now highly popular genre of science fiction caused a multitude of writings which vary in quality and in the degrees of generality and relevance to the present study. The "selected bibliography" refers primarily to the material cited in this study; it includes all fiction and all known theoretical writings of Efremov on fiction. The listed secondary sources are chosen strictly on the basis of their direct contribution to the discussion at the given level. Similarly, the listed reference works

include only those whose models may be used as classical comparisons with Efremov's theoretical systems.

The reader should be aware that Efremov, a member of the communist party uses Marxist terminology and, therefore, does not always make a clear distinction between the "scientific method" as such and the philosophical "scientific method" in reference to dialectical materialism. The problem will be referred in Chapter V, of course, within the stated boundaries of this study, not ideology or politics.

I should like to emphasize some other distinctions to be used in this study. Words beginning with capital letters will designate a particular meaning: Communism refers to Efremov's Utopian worlds; Man refers to Efremov's Communist man (Utopian man); Earth refers to the planet itself; Space is synonymous with cosmos as distinguished from linear space (i.e., a line between points A and B).

CHAPTER I

IVAN EFREMOV AND SOVIET SCIENCE FICTION

1. The Evolution of Soviet Science Fiction

During the 1950's Soviet science fiction took a new turn in its thematic and stylistic orientation. The rise of this literary genre's popularity and quality was largely due to scientific, technological, and industrial momentum and the relaxation of ideological restraints on the arts. The new writers demonstrated that they had the will to experiment with the techniques of literary genres.

Since World War II, science and technology have led the way in the intellectual and social development of industrialized countries. Breakthroughs such as Norbert Weiner's research in cybernetics, Einstein's theories on special and general relativity, the quantum mechanics, anti-matter, lasers, aeronautics, and various Space probes--all naturally produced possibilities for the formation of new orientations in philosophy of science, sociology, psychology, the arts, and most specifically science fiction.

Science fiction discusses, describes, uses, and projects these changing features of behavior. The evolution of the genre reflects the breakthroughs in scientific consciousness Soviet science fiction, therefore, has changed noticeably from the positions it held during its early decades. The main tendency in Soviet science fiction prior to the 1950's was to popularize science.[1] The narrative tended to be an oversimplified adventure story or a detective plot in which the characters might also represent conflicting ideologies.[2]

During the late thirties, the forties, and the early fifties, science fiction used the existing or immediately attainable gadgetry of applied science for its scientific and technological content. This pragmatic approach never really enabled science fiction to develop its phantastic potentials.[3] Literary works of this type were largely oriented towards economic production,[4] with a great emphasis on the immediate present.[5] It is not surprising that this approach inevitably led to the development of the schematized adventure hero. The main character in such science fiction was the traditional scientist, inventor, professor, engineer, technician, worker, or detective, with such supporting characters as sailors and pilots. These characters had very little psychological substantiality. They merely performed basic functions in an oversimplified plot. When a writer did try

to make his characters more realistic by allowing them to display some individual weaknesses, the result was generally far from plausible. This became increasingly obvious when one considered the nature of the scientific experiment undertaken by the hero.[6]

By the second half of the fifties, the change in Soviet science fiction had become quite significant. The turning point was marked by the efforts of the outstanding Soviet science fiction writer and paleontologist Ivan Antonovič Efremov. As a theorist he is primarily noted for his attempt to integrate the diverse features of the genre into a unified structure as opposed to the pluralistic and haphazard viewing of that realm, which had generally been the case. His novel The Andromeda Nebula (1958)[7] brought forth entirely new perspectives regarding the scope and method of science fiction in the Soviet Union.

Efremov has asserted on numerous occasions that science fiction as a genre has become, or is on its way to becoming, equal to the accepted levels of "Grand Literature."[8] The two main reasons for this are the external formative factors and the internal formative factors in science fiction. Efremov argues that the events of this century and the centuries to follow will be dominated by the advances made in science and technology. If this is so,, if man is aware of the impact of the Industrial Revolution, and if man now begins to feel the enormity of the impact

of automation, which is a self-feeding and rapidly accelerating process, then how does he adjust to the total formative control of science and technology? A writer who portrays this process will have to find appropriate means to do so. He will be forced to develop methods that will permit him to predict or forecast the "future-present" human concepts and behavior and to show how Man will be molded into new life patterns.

Efremov understands the complexity of the task. He sees that the accumulation of experience and technical potentialities have contributed to the rise of science to a new qualitative step. This situation is reflected in the consciousness of man and causes, in turn, greater interest in the genre of science fiction.[9]

Efremov notes that during the evolution of Soviet science fiction there were at least three reasons why science fiction did not fulfill the requirements of serious literature.

> During the birth of Soviet science fiction, a common opinion was held that this type of literature serves merely to popularize scientific knowledge or to teach science to children. Both views are incorrect. The opinions are faulty because they grasp only the smallest part of all the possibilities that science fiction can give. . . . Science fiction was also regarded as entertainment and popularization of science. This is no less an archaic opinion. Such an outlook was commonly held during the twenties and thirties, when scientific knowledge had to be propagated.[10]

But how, the science fiction reader asks, does this new knowledge change the dynamics of his world? The

reader has a better understanding of science; he begins to believe in it; he finds in it more satisfaction that ever before. The reader is more informed;[11] hence, he is more critical. He imposes requirements on science fiction which become much more rigorous as time goes on.

The complexities which make up the requirements for writing good science fiction are, of course, enormous. Efremov notes that it must be self-evident that the aspects of foreseeing the future must be as diverse as real life itself. "The depiction must be just as boundless as Man's apprehension of the world."[12]

2. Efremov's Method of Science Fiction

The depiction of the diverse aspects of the "scientific future" with its settings and plots requires new coordinates for new systems. These systems have to work and function as well as, if not better than, our "real" system. Obviously, the old prototypes are no longer physically and psychologically effective in a new world. They do not possess the required character dimensions that would make them plausible in such a world. Since science fiction settings and characters force both the writer and the reader to think in several additional dimensions, Efremov suggests that writers of science fiction have a much more difficult task than other fiction writers. He notes that:

> For us phantasts . . . our "real subject" can be seen only in our imagination; for this future is immeasurably removed from the present day. For this

> reason, the striving towards a consciousness of this or another world always means to us long and tedious reflection over the basic tendencies of the development of specific social structures.[13]

To cope with the insurmountable possibilities, a workable method has to be devised. Efremov proposes that there are two possible methods of prediction or structuring the future, or even reconstructing the past. They are the mechanical and the dialectical.

> The future will be built from the present, a present not mechanically built, but dialectically continued into the future. Therefore, the notion of a strictly determined structure of the future, as seen by many writers, is sheer metaphysics--a clumsy attempt at repeating biblical prophesies. Only the dialectical extrapolation of the real experience of the history of the Earth, Space, and human societies can lay claim to the scientific foresight of the possible future.[14]

At this point it is also interesting to note that Efremov orients the dialectical approach not merely from the present into the future but also into the past. This is evident in Efremov's works on historical topics such as On the Brink of the World, The Travel of Baurdžet, and Stellar Ships. The last describes a phantastic event of some 70,000,000 years ago.

Although On the Brink of the World and The Travels of Baudžet lack any direct scientific and technological content and hence cannot be considered as science fiction in the proper sense, these two historical novels are representative of Efremov's use of the dialectical approach to time in reconstructing the past.

In viewing the past, Efremov consistently makes use of today's knowledge of the past and compiles this knowledge according to the principles of dialectical materialism. He emphasizes not so much the character's actions but rather their positive beliefs and motivations.

In On the Brink of the World, the main character is described as follows:

> The young sculptor was slowly becoming a fighter, he was now dreadful, not only as a result of his bravery and strength, not only by his endless persistence, by his desires to preserve his body and soul in the surrounding hell. . . .
>
> This all became possible because Pandion has comrades. Comrades! Only he who had to face terrible, superior forces, who had to be alone far away from his homeland, in a foreign land, can understand the whole meaning of this word. Comrade! It also means friendly help and understanding, protection, common thoughts and dreams, good advice, useful reproach, support, consolation.[15]

Efremov sees comaradship as a particular characteristic which is present in man throughout history. However, this character trait will find its full development only in the future world of the Communist society.

> Only strong souls could foresee the future and feel the inevitable progress and the reorganization of human life. . . . Loneliness was always thought of as being the absence of close ones, relatives, and these close people formed [in the past] insignificant little groups often tied only by formal links. But now, when every person is close to you, when there are no borders or conventions to hamper the intercourse with Man in any part of the Planet . . . the problem of solipsisim is universally overcome.[16]

As a scientist Efremov sees the organic relationship between animate and inanimate matter as a basis for any prediction. The dialectical process follows a

distinctly spiralled path from living matter to the formation of the mind. At the end of the spiralled path where the spiral becomes a narrow corridor:

> Thought can appear only in a complex organism with highly developed energetics, an organism which is in a sense independent of its environment. Thus, the range of conditions necessary for the appearance of thinking beings is like a narrow corridor stretching through time and Space.[17]

Efremov writes that continuous growth and development of the mind can only be achieved in a social environment. But the social sphere must depend on elemental laws of natural selection.[18] Man can develop properly when he and his society are in control of their destiny, for "a society is such as the development of the moral fiber of its members, which depends on the new economy."[19] This is possible only under a Communist social system. For then the mind will ultimately change and modify not only nature and its environment, but finally also itself: "The main goal of society is the breeding of the physical and spiritual development of man."[20]

How does Efremov make his forecasts? What scale of values has to be taken into consideration in order to predict? What is the appropriate technical method?

Efremov stresses that it is evident that science fiction is not and cannot be prophetic foresight to an inegral picture of the future. In order to draw outlines of the future world, the science fiction writer must:

> Limit himself by subjecting his work to some one line, idea, or image. Then after choosing from the present--from the reality surrounding his life--those phenomena which appear to herald the future, he extends those into his invented world by developing them according to scientific laws [i.d., dialectical materialism].[21]

Let us now analyze such an approach to science fiction writing by segregating these three main principles: i.e., 1. projection of a line, idea, image; 2. choosing heralding material from the present; 3. develop it according to dialectical materialist principles. All three points are organically interrelated.

First. The "one-track projection" in The Andromeda Nebual is apparent in the image of the future Communist society. He shows that this society, by solving every new problem, rises ad infinitum to new qualitative levels. To solve these problems Man requires a creative urge. It is by being creative that Man finds his fulfillment in life. Then striving for creativity caused the members of the future Communist society to expand their talents, abilities, and hopes to interplanetary and interstellar exploration, communication with other worlds,[22] and the control of planetary conditions.[23] The "line" that Efremov extends in the novel is that of a clean noosphere, and progress in the environment and cosmos results in total human happiness and progress.

The novel Cor Serpentis continues the same track or line as in The Andromeda Nebula. Here, however, the emphasis is on a detailed description of the first contact in deep

Space between the people of the Earth Communist society and a rational life form from an unknown world.

In the preface Efremov explains that he created the novel The Hour of the Bull to explain his objections to contemporary writers who depict anti-utopian and forewarning novels.[24] The Hour of the Bull is an answer to such science fiction writers, who describe the future in somber colors, in catastrophies and failures and who stress "unpleasantness" in general.[25] On the other hand, Efremov also wishes to discuss the development of the future Communist society, because he had found too many science fiction works which depicted happy future societies that came into being as if by magic. These writers portray characters in such utopian societies just as if the characters were their contemporaries, transposing them directly into a future setting. These heroes have character deficiencies that are nearly as bad as those of the people living today--their imperfect ancestors.[26] These heroes, Efremov writes, are "unbalanced, impolite, talkative and plainly ironic . . . bearing greater resemblance to those who did not complete their studies, the poorly brought up loafers of today."[27]

In The Hour of the Bull Efremov wanted to point out three affirmations made by Lenin: (a) The world of matter is unfathomably complex and it will require great effort to acquire knowledge of it. (b) The change to a classless Communist society and the realization of the dream of jumping "from the kingdom of

necessity into the kingdom of freedom" will not be easy and will demand from man the highest discipline and conscious responsibility for every action he makes. (c) Capitalist economy ravages the natural resources of the planet.[28]

Second. With respect to selecting material for his creativity, Efremov notes in an interview that the process of choosing detail from available phenomena presents distinctions in the quality of imagination, distinctions about which a writer of science fiction must be aware.

> If a writer who wants to write sits down at the table simple because he decided suddenly to fantasize, assuming that fantasizing is easy since there must be no controls over what he imagines, this type of "writer" will write not phantastic works but will be doing simple fantasizing. It will be leisurely fancy, which is far from being literature.[29]

Efremov reminds the science fiction writer that science fiction was originally a novel, a novel which was dedicated to the discoveries of the Earth. For Jules Verne, science was a "competent, full-blooded character." Efremov believed that the merit of Jules Verne, or any other phantast, lies not in his creating "Nautilus" but rather, in this case, in his outlining in detail the scientific prerequisites for traveling through the oceans.[30] Efremov suggests that science fiction writers should create images of the future based on such knowledge of the future as is available.

Efremov criticized contemporary Western science fiction writers for removing from science fiction the very logic which distinguishes this genre from others. He states:

> To take science out of science fiction means a return to prereligious fantasizing, to the camp-fires of paleontological caves, where former hunters used to tell stories about winged dragons and white unicorns. It is interesting to see that "pure" science fiction, published in the West, does not differ very much from free fabrications. Its heros fly on dragons, get themselves into unrealistic societies on some . . . planet, turning themselves, in the process, into savages. Logic, causality, dialectics are violated.[31]

Efremov stresses that if a writer allows scientific or logical errors in the construction of his science fiction story the credibility of the story will be questioned. To Efremov, scientific mistakes and inaccuracies are "absolutely intolerable," not only in science fiction but in every literature.[32] For the sake of scientific credibility, Soviet science fiction avoids all sorts of "rubbish--mystics, demons, werewolves, cosmic gangsters, and frightening murders."[33] The element which essentially distinguishes science fiction from other literary genres is perhaps found in the plausible logic of the science-technology structure within the science fiction content. This structure acts directly or indirectly as an agent upon the social and human patterns of behavior, i.e., science fiction has to show how scientific achievements change man and transform nature and society. The process of this application should make up the essence of real science fiction.[34] A writer must be aware of the world in

its infinity, in its arranged complexity. The future holds for man even more complex problems than he ever perceived before. Efremov notes that ideas about man's inevitable dispersion through Space, his presence on the frontiers of the known Universe, and his contact with alien civilizations[35] are problems which will encompass all aspects of reality.[36] Legions of distinguished minds will be required, in the future, to successfully solve all these problems. And Efremov believes that to foresee all this and represent it in literature is the task of science fiction.[37]

Third. The third principle of Efremov's science fiction writing emphasizes the need to develop a philosophical perspective which will convey the precise meaning, significance, and aim of science in life.[38] Efremov develops two perspectives which will help the writer to find the values which are to be developed in science fiction. These perspectives are the long range and the short range. The long range perspective dialetically points to a guaranteed bright and optimistic future. History develops in a spiralled pattern towards the "highest social order--Communism." The writer who looks towards the future cannot avoid seeing the future world united and without war and dangers.[39] The short range perspective gives the writer a view of (a) the human and social qualities which will survive and develop in the

future communist society: "high social awareness, morality, human relationships";[40] (b) the conditions of the pre-communist societies: "oppression, exploitation, war and greed";[41] (c) a plan of battle in the ideological conflict between communism and the "harmful ideologies."[42] Efremov emphasizes that this conflict should be the leading feature of Soviet science fiction; it should reveal the possible points of collision between the communist world and the ideologies of "individualism, imperialism, petty-bourgeois competition in wealth, and the possession of things."[43]

Efremov's anti-Capitalist stand could be regarded as a carry-over theme from early Soviet science fiction. This ideological theme permeates all of Efremov's science fiction novels and stories. In The Hour of the Bull the juxtaposition and interaction of opposing ideologies and social systems is the main theme of the novel. The outcome of this opposition is in the complete metamorphosis of the pre-communist society into a communist social structure. This transformation is brought about by the qualities of the Communist heros. The whole novel--more than four hundred pages in length--answers this question: "Have there been cases, when mankind on some other planet has reached a high level of technology and productive power without becoming Communist and without destroying itself by the terrible powers of premature

knowledge?"[44] Efremov depicts the development of societies. Societies evolve in different ways, some faster than others. There might be a number of ascents before finally reaching the Communist form. Until this last stage is reached, there is a degradation of the natural resources and exhaustion of life, both of which must be corrected by the descendants during several hundred years of struggling.[45]

In The Andromeda Nebula, Efremov presents an alternative to the generally pessimistic and tragic representations of future societies.[46] But while describing the positive world of the future Communist society, Efremov also portrays tragic consequences due to irresponsible human actions: The population of the planet "Zidra" exterminated itself by indiscriminate experimentation with atomic power; the description of contemporary world events is viewed from the vantage point of future perfect society; a regressing island in the middle of the perfect society--The Island of Oblivion, which retains the pre-utopian life style--is characterized by egoism, degeneracy, and inefficiency. In Cor Serpentis, Efremov contrasts the policy held towards the extra-terrestrials held by two crews, one Capitalist and the other Communist. Efremov introduces some "ancient literary fragments," authored by "an ancient American." These are allusions to Murray Linster's science fiction

novel First Contact.[47] Leinster describes the Capitalist Earth people wrestling with a crucial problem: Had they the right to negotiate with foreign starships, or should they immediately attack and destroy the extraterrestrials, fearing that the stargers might succeed in retracing their ship's course and appear on Earth as conquerers. Efremov attributes such a disastrous confrontation to the psychological make-up of the "old societies," which arose as a result of "elemental forces." Such man did everything without planning, or forethought, without "that which distinguishes the higher forms of society."[48]

Let us now examine, from Efremov's point of view, the following questions: What should be the proper behavior when Man meets other life forms? What life forms does Man expect to meet? What laws of the Universe act upon matter in order to produce intelligent life forms? How does Efremov develop his extraterrestrials?

3. Extraterrestrials and Humans

The form and nature of extraterrestrial intelligent life has been a subject of long and serious controversy in science fiction ever since H. G. Wells speculated on the form, behavior, and motives of Martians.[49] In Soviet science fiction, A. N. Tolstoj speculated on this subject and created his extraterrestrials, once again Martians, on the same principles as the Earth characters of his time.[50] Tolstoj derived this view

about extraterrestrials from a philosophy, which held that similar laws of nature exist for all parts of the universe. Tolstoy states that:

> In the universe the dust of life travels freely. Similar arguments descented on Mars, as on Earth, and on all the miriads of cooling stars. The laws are anthropomorphic in nature . . . it is impossible to create an animal more complete than man.[51]

Efremov propounds a similar view. Efremov's theories on the evolution of intelligent and rational extraterrestrial life, however, can largely be attributed to his experience as a paleontologist. According to Efremov, all existing things evolve along the spiral path. The more difficult the environment of an organism as a biological machine, the more difficult will be the development of society. The spiral of ascension will be more tightly wound, and its coils will be closer together. It follows that the slower the process, the more standard will be the forms.[52]

Efremov devises theoretically plausible and concrete principles by which it will be possible to elaborate and determine the form, structure, and composition of extraterrestrial intelligent life, as well as their mental and emotional processes. He believes that there cannot be such things as rational monsters with tails, horns, hoofs, etc. There are no attributable conditions that would account for their existence. Only the lower forms of life are quite varied.[53] The higher the forms, the more the beings resemble one another. "Paleontology shows

us the rigid limits which evolution has set for higher organisms--remember the many external similarities among the higher vertebrates who are part of completely different subclasses, the marsupials and plancentals."[54] The higher intelligent beings will, therefore, be humanoid in appearance,[55] as well as in thought.

Efremov believes that thought follows the laws of the universe, which are alike everywhere.[56] On the higher levels of intelligent life, there should be complete communication. Efremov writes,

> Man's thought, his reasoning, reflects the laws of the logical development of the surrounding world--the whole cosmos . . . Wherever thought appears, it will inevitably be founded on mathematical and dialectical logic. It is impossible to have "other" dissimilar thought processes, since there cannot be a person outside society or nature.[57]

Furthermore, the physical appearance and constitution of the intelligent extraterrestrials will have to be based on similar "universal" concepts of beauty. Man's form and the view of it, is not accidental. The diverse levels of his adaptability to the environment exert great demands on his brain. "Beauty in man, as compared with that of all other animals, lies not only in perfection, but also in his universality, boosted and refined by intellectual activity and spiritual training."[58] It is, therefore, inconceivable that there will be intelligent "thinking monsters, human mushrooms, octopus-men!"[59] The beings are likely to be "highly perfected and universal, that is, beautiful!"[60]

Efremov creates human characters following the above mentioned model of the spiralled evolutionary process, that is, the bio-psycho-social pattern which follows the universal laws of dialectical materialism. Man's reasoning reflects the logical development of his environment. If mankind of the future will live in a "higher social communist world" Man will then reflect the values and the logic of the higher society. Efremov considers the task of creating the "diverse facets of the future, as they are reflected in the consciousness of people not yet living--which is created by the writer's imagination," as being the practical and boundless field for science fiction.[61] The facets, which will portray the future Man's consciousness, are unlimited in possibilities.

How does one achieve authenticity in portraying nonexistant characters in a nonexistant society? Efremov notes that there are two conditions that give coordinates for the writer. They are the realization that traits have to be many-sided in their complexity, and the understanding that the action takes place in a setting which is not analogous to the present. Both coordinates should help to create authenticity and provide perspective for the depiction of the characters and features of a future world.[62]

This chapter has been included to present Efremov's principles for writing science fiction. The main principles mentioned above will be analyzed in the

the following three chapters which will focus upon: (a) the use of scientific and technological material in artistic literature; (b) the social, or utopian, theme in Efremov's science fiction; (c) the creation of prototypes and characters for science fiction. Efremov's own examples will be examined as they appear in his science fiction works: Stellar Ships, The Andromeda Nebula, Cor Serpentis, The Hour of the Bull.

CHAPTER II

SCIENCE IN SCIENCE FICTION

1. Scientific License

Generally scientific and technological material is applied to science fiction in a variety of ways. For example, it may help to establish a setting: orbiting or Moon Space stations, starships, automated cities; or it may provide the basis for a living and freely acting character: robot, android, cybernetic brain, etc. But in each case, the use and description of this material not only has to comply with the logic and the precision of an exact science--thus making science fiction credible and plausible--but also has to attain artistic and literary magnitude. Artistic literature might incorporate within its content psychological, philosophical, and sociological themes; in science fiction, the scientific and technological material interplays with these themes in a way that may never have existed before. Such concepts as language, life, death, memory, intelligence, consciousness, morality, society, thought, mind, biological and genetic engineering are all re-evaluated under the impact of new scientific information and control.

Efremov points out that scientific investigation develops methodologically and systematically only a small part of the observed phenomena. Much more information still remains hidden. Efremov assumes that within the greater phenomena "one can find the most alluring flights of science."[1] The more serious task of science fiction, therefore, would be to attract attention to these as yet unresearched or forgotten possibilities.[2] This task poses the following questions: (a) Should the sciences incorporated in modern science fiction be exclusively theoretical, since it is to focus attention on new possibilities? (b) Are only scientists qualified to write science fiction? (c) Is phantasy controlled by science?

Efremov believes that in the past science fiction relied on too narrow and one-sided an application of science, that it neglected the rich branch of theoretical science. Today science fiction absorbs the possibilities that theoretical science can bring but, at the same time, does not neglect the practical aspects of science and technology.[3] Both fiction and theoretical science rely on the mechanics of the imagination by selectively using material from practical life.

It would seem that in order to dwell in the realm of theoretical science, the writer of science fiction would have to be a trained scientist who is in the forefront of research and has a broad outlook on the history

of science.[4] But this is not a practical prerequisite, since one would have to embrace two occupations in an age when fields tend to become more and more specialized.

In science fiction, Efremov believes, phantasy has to "lead" science.[5] It can do so by giving a comprehensive view of the world at any given time, and in this phantasy surpasses science. But, at the same time, phantasy can outstrip science only by deriving its material from some definite knowledge. This, of course, is only possible when the writer is himself a scientist: generally, phantasy "cannot compete with science in the explanation and mastery of nature and society."[6]

In this sense one can speak of the primacy of science over phantasy. Therefore, due to its content, science fiction has to rely primarily on the latest research breakthroughs and theories in science for its source, and as fiction it has to show new paths to science and open new vistas into the mysterious.[7]

How does Efremov propose a phantast should use the scientific and technological material in fiction? In how many ways can this material be used esthetically?

Both scientific theory and science fiction rely primarily on the mechanics of imagination to elaborate their respective coordinates. It seems logical, therefore, to begin the analysis of the inter-connections between scientific theory and science fiction at the most abstract

level at which science is applied to science fiction. Such a use of scientific theory might be termed "scientific license." This term, reminiscent of the term "poetic license," differs from the latter primarily in that "poetic license" deals with form while "scientific license" stresses content. Scientific license may be defined as a literary device which uses, within limits of existing scientific knowledge, unverified or improbable data of theoretical or applied science in order to widen the boundaries of science and of traditional literature. To explain the application of this device, it is helpful to examine three basic categories of scientific content: theoretical, operative, and descriptive.

The use of scientific license with regard to theoretical content involves explanations of some empirical uniformities previously discovered and serves to predict some new regularities. Efremov develops this use in great detail. Using the latest theories of science, he constructs a unified concept and interpretation of the universe and then invents, develops, and extends new universal laws in science by applying the dialectical materialist method. At times Efremov's use of scientific license with theoretical content would appear to overload his science fiction story with phantastic terms. The novels seem saturated with material which is sometimes scientifically questionable. In a special glossary to

The Andromeda Nebula fifty-nine terms are defined or explained: of these, twenty-seven are phantastic. The same also appears in Efremov's other science fiction works,[8] but Efremov is aware of exceeding his own norms; he intentionally uses the phantastic terms to give color to the dialogues and actions of the people of the future--he wants to underlie the "deep roots of science in all concepts, notions, and language in the future."[9]

Scientific license taken with the theoretical content of The Andromeda Nebula is exemplified when one of the heroes, Ren Boz, explains extensively his theories regarding the total harmony between gravity, anti-gravity, matter, time, subnuclear particles, antispace, and light. He explains it in the following manner: More than ten centuries prior to the Era of the Great Ring the mathematician Heisenberg developed the uncertainty principle--the impossibility of predicting the exact placement of small particles. Actually the impossibility has become possible with the final understanding of intertransference, that is, of rapagular calculus. At about the same time the atomic meson ring cloud was discovered--the condition of transfer between the nuclean and this ring permitted the understanding of antigravity. But to put this theory to practice the answer is found through dialectics--in its opposite. The physicists receive an antigravitational shadow not discretely but vectorily, it

was known as the problem of four dimensions. The "ancients" knew about the Spacial multidimensionality, but they did not know about the shadow properties of gravity. They thought that singular points meant the disappearance of matter or its change into something undescribable. If the distance from star A to the center of the Earth is represented by line OA, the distance will be twenty quintallion kilometers. But from that same star by the vector OB, the distance is equal to zero, actually, not precisely to zero but at least tending towards zero in magnitude. And time becomes equal to zero if the speed of motion is equal to the speed of light. And cochlear calculus was also discovered not long before the EGR, but not their laws! If the field of gravity and the electromagnetic field are two sides of one and the same property, then Space is the function of the electromagnetic field--antispace. The transfer between them gives a vector shade function of zero-space which is commonly known as the speed of light. And it is possible to achieve zero-space in any direction.[10]

From the above quotation, the following terms pertain to current scientific concepts: Meson,[11] nucleon,[12] and "time is equal to zero if the velocity is equal to the velocity of light" known as the Lorentz transformation.[13] The phantastic terms are:

> Rapagular Calculus: a calculus in bipolar mathematics that deals with the solution of the direction at the moment of transference (repagulum) from one state into another, from one mathematical sign to another.[14]
>
> Bipolar mathematics: mathematics based on dialectical logic with opposite analysis and solution.[15]
>
> Cochlear Calculus: a division of bipolar mathematics dealing with the analysis of spiral foregoing motion.[16]

Singular points, meaning the critical points of transference from quantity to quality, is semi-phantastic.

All these "scientific" concepts are dialectically conceived, and in this way they formulate a phantastic scientific explanation of the development of science in the future world.

Another example of scientific license in theoretical content can be found in the novel The Hour of the Bull. A similar method is used to explain how a Starship might bridge great interstellar distances in extremely short time periods. Antimatter is the new term used, and it is a legitimate term in today's scientific vocabulary.[17]

> [After having understood] the spiral organization of the universe . . . it was possible to solve the problem of ultradistant interstellar travel. Mathematicians knew about the bipolar structure of the world, which mathematicians knew about during the Era of the Divided World, but physicists of that time confused the question with their naive ideas about antimatter . . .
>
> . . . . . .
>
> Scientists called the anti-world, the black world, Tamas, by the name of an ocean of inactive energy in ancient Hindu philosophy. This Tamas is in all respects polar to our world, and because of this it is absolutely unapparent to our senses. Only recently, with the help of special instruments which were as

> if turned "inside out" in relation to the instruments of our world, conventionally called the world of Šakti we began to feel out the outer contours of Tamas. We do not know if in Tamas the star formations and planets are analogous to ours, even though by the laws of dialectical philosophy movement of matter has to exist there also. . . . It turned out that light and other radiation never spread through the universe in a rectilinear way, but wound itself onto a spiral, simultaneously sliding on the helicoid and unwinding more as it moved off further away from the viewer. Compression and spreading of light waves as they became shorter while entering the spiral depths, and the apparent difussion of stars and galaxies further in the coils received their explanation. The Lorentz transformation with its disappearance of time and its accumulation of mass with light velocity was solved. Another step, and zero Space was comprehended as a border line between the world and the antiworld, between the world of Šakti and Tamas where polar points of Space, time and energy are mutually balanced and neutralized. Zero Space is also twisted into a spiral corresponding to both worlds. . . . [For a starship to reach any point in the universe] it travels not along the spiral path of light but as if across it by the longitudinal axis of the helix, using the anizotropy of Space. Moreover, the starship in relation to time appears to be standing in one place, and the whole world spiral turns around it. . . .[18]

Efremov's use of "theoretical scientific license" combines existing theories of theoretical science and projects their effect by employing the dialectical method.

A second basic use of scientific license may be found in the operational type of scientific content. Here we have a short, plausible scientific explanation which is not directly involved in the movement of the story but has to be given in order to justify the logic of the conventions used in science fiction. Efremov's novel Cor Serpentis has several examples of the use of scientific license in presenting operational content. A

starship travels through Space at warp speeds to reach a destination where the process of the transformation of matter in a carbon star can be studied.[19] Although the speed of the starship through Space--six-sevenths of the speed of light[20]--is irrelevant to the main idea of the story. Efremov has to explain and logically prove the plausibility of achieving such speeds in the light of existing scientific and technological knowledge. He has to do so for the following three reasons: The mechanics of the propulsion unit used on the starship have to be compatible with the outcome described in the story, in this way bringing the story closer to credible conceptions and thus dispersing the lingering element of fantasy.[21] The mechanics of the propulsion unit will determine the behavior, the choices, the goals, and the problems encountered by the ship and the crew. The propulsion unit will tell something about the technological sophistication and development of the civilization that built and used such mechanisms.

> Through this wide corridor of Space free of star clusters and dark clouds passed the Tellur--the first warp starship from Earth. This type of starship travelling through zero-space had to reach much further depths of the Galaxy than the earlier nuclear rocket and anameson-propelled starships, which reached only the top speed of five-sixths and six-sevenths the velocity of light. The warp ships acted on the principle of time compression and were thousands of times faster. But one problem remained with the starships--during a warp they were difficult to control. Man could bear the warp only in an unconscious state, protected inside powerful magnetic fields. The

> Tellur moved as if in bursts, each time carefully checking whether it was clear to proceed with the next warp.[22]

Another example of scientific license as applied to operational content appears in Cor Serpentis during an in-Space contact between Earth people and extraterrestrial intelligent beings, with communication made possible through "visual pictures." The aliens showed on a screen the composition of their breathing atmosphere:

> The lower figure apparently is the basic element of the ocean: one electron around the nucleus--hydrogen. The upper figure is the principal element of the atmosphere and respiration: nine electrons around the nucleus--fluorine! . . . On the upper left it has six electrons--carbon; on the right: seven--nitrogen . . . Everything will be as on Earth except for the central upper fluorine, we will have oxygen with its eight electrons.[23]

This information made it clear that: (a) Communication between the two ships would be restricted to visual means--the atmosphere of one is poisonous for the other. (b) An atmosphere where fluorine is the prime energy-producing element will have beneficial effects on the physio-psychological constitution of one of the beings and detrimental effects on the other. (c) The presence of fluorine in the atmosphere of the planet gives evidence that the evolution of the planet had different critical variations than those of the Earth. (d) The evolution of life in a fluorine atmosphere must be different from that on Earth. In science fiction, these factors must be elaborated in detail, because each factor determines the

conventions used in the story. Efremov's use of fluorine as the basic chemical element for the sustenance of life is chemically unfeasible for a number of reasons.[24] He uses such scientific license to show that Earth's planetary conditions for life might not necessarily be the standard for all life forms in the universe. Efremov wishes to prove that if life in such an alien world can reach a complex level, then the intelligent, rational, living forms will resemble the ones on Earth;[25] and that the laws which act on the development of the mind are universal since "thought follows laws of the universe, which are the same everywhere."[26]

Efremov further develops the use of the operational scientific license in his novel The Andromeda Nebula by giving new configurations to known stellar constellations and adding planetary systems to some of the known stars.

> The Swan, one of the most interesting star constellations of the northern sky, . . . includes a beautiful double star, which was named Al'bireo by the ancient Arabs. Actually there are three stars: Al'bireo I and a double star Al'bireo II a huge pale blue star with a large planetary system. This star is almost as far from us as the gigantic light which comes from the tail of the Swan Denel, a white star with a luminosity of four thousand eight hundred of our suns.[27]

Efremov not only had to imagine some locations for inhabited planets in the Universe and to describe certain stellar conditions such as double stars, stars with greater luminosities than our sun, or stars of various

colors of the spectrum, but he wanted to present all these conditions in an attractive, esthetic manner. He wanted to create an appealing environment which would widen man's horizons and heighten his awareness of the wonders of the universe.

Thirdly, we can consider the use of scientific license with descriptive content. Such use is primarily an esthetic device. It brings the reader still closer to the understanding of new experiences, behavior, motivations, and environment as they are depicted in science fiction. For example, in The Andromeda Nebula two scientists, Ren Boz and Mven Mas, conduct an experiment with zero-space. The experiment ends disastrously, just as it did when Bet Lon, their predecessor, performed similar experiments by sending multitudes of volunteers into zero-space.[28] Several centuries later, however, zero-space was finally mastered. This mastery permitted starships to travel between the stars and galaxies in extremely short periods of time. The feelings experienced by Čedi traveling through zero-space are described in the novel The Hour of the Bull.

> And suddenly everything went off. The feeling of falling through, falling into an abyss without any support or rescue added a sinking feeling in the consciousness of Čedi. The unbearable, torturous feeling of the inner nervous explosion forced her to scream hysterically and without sense. Actually, Čedi only silently moved her lips. She felt as though her whole being was evaporating, just like

> drops of water. Then an icy cold feeling welded her into the depths of the abyss into which she was constantly falling.[29]

To describe some experience which has never been or never will be experienced by man requires a meticulous ability to relate unusual bits of experience. In this case, the physico-psychological feelings of Čedi have to pass as genuine emotional combinations. Scientific license as applied to descriptive material can extend and explore the gamut of possibilities, thus giving a new dimension to the characters in the story, as well as to the genre in general.

Descriptive scientific license can and usually does describe original geographical settings. Space travelers in the novel The Andromeda Nebula arrive on the outskirts of our solar system on Pluto satellite Triton.[30]

> They dove to the bottom of the nether world, under the thick neon-methane atmosphere of Pluto. They flew through storms of ammonium snow, . . . They were able to find the section where naked mountains stood out. The riddle of Pluto was finally solved--it was a planet which did not belong to our solar system. It was captured during a period of time when the sun was travelling through the Galaxy. This is why Pluto's mass is so much heavier than that of any other far planets. Unusual minerals from a completely foreign world were found by explorers. But what is even more important is that on one mountain ridge, evidence was found of destroyed constructions, giving evidence of some unimaginable ancient civilizations.[31]

Scientific license has been categorized above in terms of its three major uses. Of these, its use with descriptive content resembles most closely the standards

and qualities of general fiction; its use with theoretical material results in the most scientifically oriented element in science fiction; its use with operational content stands closest to the traditional conception of science fiction writing.

2. Science: Theoretical and Applied

Science and technology make up the substance of Efremov's future communist society and are concrete indicators for all achievements in society: planetary population integration, health, climate control, education, interstellar travel, perfection of the "genefund," ethics and behavior. Without the guarantees science and technology can give, organization and progress in society will have little chance for success.

According to Efremov, science is not uniform; it presents a process which develops, like all processes, by contradiction.[32] But scientists cannot consider themselves to be the only prophets. Scientists realize that beneath their formulated theories, there are always contradictions which they do not have the strength to solve. Efremov notes that man will need means other than calculation and experiment for solving the greatest riddles of existence.[33] He finds that the use of the scientific method sets limits to the knowledge of the universe and its complexities. The scientific method only predetermines the incompleteness of an explanation of

the world since none of the scientific discoveries or laws are complete or final. The more knowledge develops, the more mysteries remain to be discovered.

Efremov emphasizes the distinction between science and technology. There is a danger of acquiring incorrect science. If scientists concentrate exclusively on the applied aspects of science, the next generation will be "simply ignorant technologists, who think of themselves as being scientists, and who gradually begin to think about the possibility of rearranging the universe, without having begun to understand the complexity of its laws."[34]

How are scientists distinguished from laboratory technicians? Which of them is responsible for the larger share of the development of scientific knowledge? Efremov uses the principles of contradiction to distinguish two types of scientists.

> Some scientists are endowed with a great and lively imagination. They "dream" in science; they move in it freely as if through the air. Others, the conservative, and analytical types, move in the realm of discovery slowly but firmly, uncovering the mysterious in nature. Such scientists restrain and check the "dreaming" phantasts. If the relation between the two types was equal then we would have had a dialectical balanced contradiction and a speedy movement ahead. But the conservative type of scientists are in the majority, particularly in the descriptive sciences, where imagination is of less value, than in physics or mathematics.[35]

The conservative scientists, who restrain the "visionary" scientists, keep science from becoming formless and theoretical. By verifying through experience, by

reconstructing the processes, they give substance to scientific theories, and permit further mastery of natural processes.[36]

> It is necessary to correct Einstein's remark that "imagination is more important than knowledge." Even if his imagination did bring him to the discovery of the fundamental law of the relation of mass and energy, the enormous labor of men and large material expenditures of material were needed before success in atomic power was achieved.[37]

Efremov sees that phantasy in science will stimulate scientific progress and determine its tempo only if the "visionary" scientist has a thorough training, serious preparation, discipline in reasoning, and mastery of scientific material just as the "restraining" conservative does.[38]

Efremov notes that the condition of science today is such that when simultaneous research is undertaken in varied branches of science, a gap usually appears in the progress of some branches--physics, chemistry, mathematics and a lag in others--biology and medicine. This uneven development in science might lead to uneven and varied representations of the world. Efremov is convinced that these discrepancies within science might result in the belief that nature is somehow separated from man. "Nature then becomes something hostile, which must be subjected to the limited goals of the society."[39]

Contemporary scientists, due to their highly specialized training, are, in this sense, "uneducated

scientists."[40] Efremov notes that this notion is paradoxical only because old concepts of what scientists ought to be, i.e., carriers of encyclopedic knowledge, still linger in the mind of the average man. The modern scientist is too specialized in his particular field. He does not have an overall view of what is being done in scientific research. Efremov, therefore, proposes that science fiction "can give the specialist-scientist a view of his position and his scientific achievements in the light of the total development of society."[41]

How can science fiction give an overall perspective of scientific achievement? Who can provide the perspective? If today's scientific knowledge is split up into narrower specialized problems and theories,[42] and ceases to interpret the world,[43] while the world remains unified, Efremov suggests that the scientists-encyclopedists can and will help by developing a new "nature philosophy."[44] The advantage of such a philosophy would lie in the breadth of its approach to specific concepts in science. Such a philosophy would be ready to answer any general or particular question; it would have the "unquestionable dignity of looking at a subject of investigation with a broad view."[45] In this perspective, phantasy will give advice to the individual branches of knowledge.

> A great significance is acquired by science when the scientist sees in literature such as science fiction what is sometimes difficult for him to interpret by himself, i.e., the process of his discoveries and the

> experience from life and by man, and also not only the positive side of life but sometimes even the tragically evil.[46]

Efremov reminds the reader that science fiction foretold the appearance of submarines, airplanes, and television, and that science fiction now actively helps the scientist to work on the problems of "lasers, quasars, robots, transmission of information, etc."[47]

3. Science: From Ethics to Gadgets

Efremov divides the actual scientific-technological material throughout his science fiction in a way which parallels the use of scientific license in science fiction. There are three major applications: the hypothetical which includes ethical and speculative content; the technical, and the decorative.

The hypothetical-ethical application of scientific-technological material in science fiction exposes science in the light of its meaning for society and man. Efremov also emphasizes the significance of science and technology for civilization. Man's complexity, like that of nature, is a delicate balance of all the integral parts which grow and evolve to their form and balance by a game of chance played for numerous years. Man, however, must free himself from this game of chance which tends to lead to death and extinction. Man must control his destiny. He can survive only by using his total potentialities, i.e., by having a

Communist education. This education consists, Efremov continues, of a complete examination of man's historical development, of an analysis of all the mistakes made in the past. The study of these mistakes will show how man can avoid the repetition of such errors and failures.[48] Shortsightedness on the part of scientists towards nature can bring tragic consequences.

Efremov develops ethical themes in his science fiction, which analyse the uses and abuses of science towards man. These are usually dialogues about the application of scientific experimentation and its implications for man. In the novel, The Hour of the Bull, Efremov develops such themes as medicine in society, technology and man, psychology and man. Efremov noted that today in medicine, in order to conquer separate manifestations of disease by chemistry, scientists really only manage to do away with small natural purturbations but overlook, in the process, the mass consequences that usually appear as side effects from such treatment. The scientists, in such cases, merely suppress the symptoms rather than heal the disease. Consequences usually appear in the form of numerous allergies, the most terrible variety of which is cancer.[49] Defensive arrangements in the organism are damaged by the uncontrolled use of medicines and surgery.

Likewise modern life substantially reduces man's normal physical capability. The gradual weakening of the

organism's muscular, ligamentous and skeletal systems leads to a "massive development of hernia, flatfootedness, near-sightedness, to a substantial increase in various fractures, widening of veins, hemorrhoids, growth of polipi and the weakening of sphincters along with a defective digestion, and particularly the appearance of appendicitis."[50] Well-motivated efforts such as the reduction of infant mortality has brought disastrous results. Many physically and psychologically defective children and complete cretins are saved. Multiple births increase, alarmingly lowering, in the process, the physical and mental health of the whole population.[51]

Efremov emphasizes that it is also possible to destroy the human soul--the psychological "I" in man. Man can be deprived of his normal emotions, love, and psychological training by mechanical and chemical means. He is then reduced to a thinking machine, which becomes dangerous as he is entrusted with scientific experiment and the supervision of ordinary people. To give an example Efremov describes the age which existed just before the beginning of the world Communist utopia:

> Inventing the mythical image of the king of evil--Satan, man became that image himself, particularly with respect to animals. . . . The deeper knowledge is, the stronger evil can become! Methods were devised to create biological monsters--such as brains living in solution apart from the body, or such as connecting certain sections of human bodies with machines.[52]

Another important problem which Efremov discusses is the assimilation of information in the contemporary world. Information multiplies rapidly. Millions of books are written and published, duplicating and triplicating information, leading men simply to pass their time arguing about obsolete developments.

> It appears that man builds himself [information] Babylon Towers, and the higher its storeys mount the more the Tower widens at its base. The structure of contemporary science is like an inverted cone which balances itself on its top. As it is known, such a structure is extremely unstable. This Tower will very soon fall apart if mankind does not learn to see the depth of things, does not learn to generalize information by some new method.[53]

Efremov's speculative side of the hypothetical use of science and technology in science fiction is primarily related to the development of existing contemporary scientific theories as they would be actualized in a science fiction story. Philosophy and ethics are excluded as a direct influence in the speculative use of science and technology. Examples can be found in Cor Serpentis in which Efremov discusses the relationship between the new concepts that arise with the effects on the objects that approach the velocity of light with their relative Time distortions vis-a-vis another body--Earth.[54] The Space travelers of the starship "Tellur" are at a distance of seventy-eight light years from Earth. Their destination is a carbon star in the constellation of

Herculese, located 350 light years or 110 parsecs[55] from the Earth's sun:

> "Twenty-four parsecs!" exclaimed Mut Ang, "And it seemed to have been only a moment . . ."
> "The moment of a dream similar to death," sullenly objected Tej Eron, "and generally on Earth . . ."
> "It is better not to think," Kaŕi Ram straightened himself, "that more than seventy-eight years have passed since we left. Many of our friends and relatives are dead, much has changed. . . . What will happen when . . ."
> "This is inevitable with long flights with any system of starships," quietly said the commander, "Aboard the Tellur time moves particularly fast, and even if we penetrate further into the Cosmos than anyone else we will return unchanged."[56]

Efremov speculates further about the paradoxes of Time versus knowledge. Starships which would have been built fifty years earlier would be slower and would not be back from their expeditions for another two years, although the distances were thousands of times shorter than those that the Tellur had to travel. At the time, new ships would be built--more efficient than the Tellur. Upon the Tellur's return, it would provide obsolete information from its mission.

> With the return of each starship to Earth, tens of other arrivals came from another time--representative of a distant past. And even if the level of their ancestors was very high, all the new ages seemed alien to them, and often a deep melancholy and a sense of isolation became the lot of these cosmic wanderers.
>
> Now warp starships hurl men still further. Astronauts measure their elapsed time in moments but they still will return to Earth as thousand-year-old Methuselahs.[57]

In Stellar Ships Efremov speculates on the possibility of extraterrestrial visits to Earth some 70,000,000 years ago. The extraterrestrial visit was feasible because:

> Our solar system describes inside the Galaxy a huge eliptic orbit with one revolution occurring every 220 million years. The orbit inclines slightly towards the horizontal plane of the stellar "wheel" of our Galaxy. The Sun and the planets, therefore, at a given period cut through the curtain of black substance--dust and disintegrated solidified material--lying in the equatorial plane of the Galaxy "wheel." At this point the Sun approaches the condensed stellar system of the central regions, such, for example as the Archer constellation. And it is then possible that our solar system approaches other unknown systems at a distance which permits Space travel.[58]

Efremov uses "hypothetical" scientific-technological material to make the reader aware of the problems and new concepts which might arise as a result of changes brought about by actualized scientific theories and developments.

The second use, i.e., the technical use of scientific-technological material is primarily the application of existing applied science innovations or those which will likely be developed in one form or another at some future date. For example; the Chinese fire-cracker led not only to the discovery of the principles of ballistics, but also of rocket propulsion. Since many innovations might be unfamiliar to the reader, the "technical

use" requires a certain amount of explanation of the workings of the objects described in the story.

Efremov distinguishes two major types of "technical" material--the biological and the mechanical. The biological side of technology encompasses in Efremov's science fiction novels the achievements made in medicine, biological and genetic engineering, and physico-psychology.

Efremov writes that future utopian medicine will heal by seeking out the cause rather than the symptom of an illness. In Cor Serpentis an astronavigator developed an attack of acute appendicitis--he seemed not to have completed the program of medical preparation for the Space flight. An operation was requested, but the doctor expressed some doubt of its necessity.

> Contemporary medicine possessing the methods to regulate the nerve impulses of the human organism--much as in the electronic system--could have eliminated the diseases. But the physician of the starship argued and proved that this would not remove the locus of infection, which might appear again with the tremendous physiological strains on Space flights.[59]

The diagnostic machine revealed the cause and recommended proper combinations of antibiotics and disinfectants for the inflammation. The medicine worked as follows:

> The segmented instrument released long flexible tendrils deep into the appendix. Puss and foreign matter were sucked away, the appendix was cleansed of the foreign elements and rinsed thoroughly with biological solutions, which quickly healed the mucous membrane of the intestines and the appendix.[60]

In another medical case, Ren Boz (The Andromeda Nebula) was a victim of an explosion, leaving his body torn and broken. With utopian medical knowledge and technology, Ren Boz was reconstructed to his original physical and psychological state.

> Ren Boz was transported under a plastic dome, which was completely sterilized and blown through with sterilized air, which passed through special filters. [The Doctor] and four of his assistants entered the first section of the operational and remained there several hours. This operational was subjected to bactericide waves and saturated with antiseptic emanations of air, until their own breath became sterile. By this time Ren Boz's body was strongly cooled. . . .[61]

The technical aspects of the operation are further elaborated in detail throughout two pages of the novel. During the operation a quick skin-healing liquid was used--BZ-14; artificial blood was pumped through the lifeless body of the victim.

In biological and genetic engineering Efremov discusses the need to diversify the existing natural characteristics of the genetic code by uniting them to form new mutations. Such a process guarantees a biological and psychological regeneration of the human race.

> The great variety in man's appearance on Earth, particularly during the Era of Common Labor, when the most different races and nationalities began to blend together, surpassed all imagination. All kinds of shades of hair, eyes, complection and features of body structure were combined in the offsprings of the kxmero-evenko-indians, spanish-russo-japanese, anglo-polenesian-zuluso-norwegians, basque-italo-arabo-indonesians, etc. . . . The scope of choice of genetic combinations guaranteed life eternity without degeneracy, that is, a boundless rise of mankind.[62]

The process of human crossing took many years to complete, it was, however, an important step which permitted further development and betterment of the human race. About the time of the Era of the Great Ring, a new more complete type of man appeared on the surface of the Earth. This Man replaced the preceding physically varied type of Man of the Era of Common Labor. Until that Era, the population was divided into two main categories: The neandrathaloids, who were stronger, had massive bones and a rough body structure; the cromanoloids, with a thinner skeleton, were taller, more delicate in their psychology, and more sensitive in their feelings.[63] The geneticists at that time, selected the best from each, and combined this into one. This was done during the Era of the Great Ring. During the next Era, the geneticists created still a better, more universal type of Man--the Man from the Era of the Met Hands (The Hour of the Bull).

The conditioning of the physico-psychological constitution of Man--the cleaning or purification of the noosphere, is one of the basic undertakings by Man which will guarantee a utopian continuity. The condition of the noosphere results from the accumulation of all the thoughts, dreams, ideas, and images formed by generations of human cultures over thousands of years.

> Along with the bright images of teachers, creators of beauty, knights of King Arthur, . . . we had creations of the dark fantasy of demonic killers, satanical women and sadists. Taking the form of secured clichés, throughout the noosphere, they were able to create not only hallucinations, but to even thwart achievements, by acting through the psyche on the behavior of man.[64]

The "mechanical aspect" of Efremov's "technical use" of scientific-technological material ranges from robots and self-cleaning houses, to super highways and interstellar ships. Automation during the Communist era, develops to a high degree of perfection. In The Andromeda Nebula, there exists a society for two millenia which has practically no maintenance service--everything is fully automatic. There is direct access to a local central information agencies and central computer memory banks.[65] The thoroughly conceived plans for public buildings systems and living quarters systems permitted automatic self-cleaning exterior and interior mechanisms that relieved Man from burdensome routine.

Automation is also complete on the starship Tellur (Cor Serpentis) on which the navigators have access to a new kind of musical instrument, which replaced the old piano.

> The EMVP--electromagnetic vialiano--had long since replaced the harsh-toned, obsolete piano, but had kept its polyphony, giving it a richness in tone. The amplifiers of this instrument, were able to give at a moment's notice amazing power. . . . As on the ancient piano the musician's fingers gave all the shadings of sound, but not by striking the hammer on the string, but rather through delicate electronic impulses with light fineness.[66]

Automation can also be seen in Efremov's series of robots built for the most varied purposes. In The Andromeda Nebula, an automatic carriage loaded with the universal robot, was controlled from the ship "lifted a heavy cutter with its four top extensions"[67] and bored through the exterior of the dead Alien disk-shape starship. Efremov also describes robots that help in mining,[68] carriage-robots,[69] robot-astronauts,[70] and robots which control the warp of the protective field of the starship.[71]

The invention and description of starship propulsion units requires from the writer a knowledge not only of the known or blueprint plans for Space propulsion units, but the imagination of new concepts for Space propulsion. In Cor Serpentis, two types of propulsion units are designed, each based on different concepts: the first is an extension from the atomic rocket, the "anameson nuclear rocket," defined as a rocket which uses an atomic fuel in which "meson bounds of the nucleus of the atom have been disrupted, it has an expiry flow close to the velocity of the speed of light";[72] the second is the bending of Space and Time--zero Space.

> The Tellur was the first warp ship from Earth. This type of starship, moving in zero-Space, had to penetrate further to the depths of the Galaxy than earlier anameson nuclear rocket ships, whose top speed was only five-sixths or six-sevenths of the speed of light. Warp ships act ed on the principle of time compression and were thousands of times faster. But their one dangerous feature was that the starship during a warp, was out of the crew's

> control. Men in addition could bear the warp only in an unconscious state, protected in a powerful magnetic field. The Tellur travelled in intermittent bursts, checking carefully whether its way was clear for the next warp.[73]

Explanation of the functioning of certain experimental gadgets adds credibility to a Space expedition. Circling the planet Tarmans in an orbit the technicians in The Hour of the Bull in the Earth starship "Dark Flame" prepared sensor rockets to be sent to the planet for the examination of its elemental composition.

> Soon packages of spiral tubes, contained in five meter fish-like casings, tore themselves from the ship, drew a wide paraboly and touched the surface of the planet in predetermined places. One struck on the ocean waves, another passed through its depths, a third scubbed the river, the following ones tilted a part of a field, rivers, and some green sections of vegetation. . . .[74]

When the rocket sensors returned to the ship, analytical comparitors examined the samples. The result indicated that the planet had two viruses which were unusual and whose cause was attributed to the overpopulation of the planet.[75] For immunity, the navigators took a pill-"AGN-102" and put on indestructable metal-like scafenders.

> The scafenders could not be penetrated by knife, bullet, or pirobeams. . . . They were prepared by a special institute. The scafenders were made from layers of molecularly transformed metal, insulated by a lining, which was soft to the skin. . . . The thickness of the scafenders was measurable in millimeters . . .[76]

The technical use of scientific-technological material in science fiction is primarily an explanatory exposition of the necessary biological or mechanical entities used in the science fiction story.

The third use of scientific-technological material is decorative, forming a background of convincing detail against which the action of the story takes place. It is not the function of decorative use to explain what makes a scientific or technological unit work; it is assumed that it does so under the proper conditions. Decorative material can, however, be operative, such as in versatile electronic chairs. Such a use of material shows the practical purposes for which the thing was built. For example, Space ships can vary in dimension and shape but these characteristics have to reflect as much as possible the function and technical purpose for which the Ship was built. Comparing the starship "Tellur" (Cor Serpentis) with its predecessor ships the difference is found in their size, versatility, and in the number, as well as, in the quality of the crew.

> The Tellur, or as it was registered in the Earth's cosmic fleet, IF-1(Z-685)--the first inverted-field Spaceship, or the 685th Spaceship ever built--was smaller than its sublight speed long-range predecessors. They were replaced not so long ago--with the appearance of the warp ships. . . . Those colossal ships had crews of up to two hundred people; new generations born during the flights made it possible to travel deep into interstellar Space. . . .

> Even though the Tellur was smaller than its predecessors, it was nevertheless an enormous ship with spacious accommodations for its [eight member] crew.[77]

The description of the Tellur provides some conventions for the setting and the action. A ship too large or too small for the expedition or for its crew, introduces an uncomfortable sense of expectation which is never fulfilled or justified. Why cross a lake on the "Queen Mary," or an ocean in a rowboat? The Tellur is primarily a warp ship, but it uses nuclear engines when it travels at velocities of six-sevenths the speed of light.[78] The interior of the ship is described in detail: it has a central control room with a panel board the width of the cabin;[79] the ceiling in the control cabin has niches, pipes, crossbeams, and wires;[80] it also has mechanical units such as a computer,[81] a robot,[82] protective vortical fields[83] and receptor shields,[84] optical radio telescopes,[85] as well as a complete gymnasium,[86] a large pool with ionized water,[87] a library,[88] and a medical lab with diagnostic automatic machinery and other automatic equipment.[89]

The Alien starships shape and maneuverability (Cor Serpentis), also presents some characteristics of its propulsion, and interior.

> The strange ship resembled a spool--two cones united by a cylinder. The base of one of the cones, apparently the forward one, was covered by a dome; on the rear a wide funnel opened towards Space. The

> middle of the ship protruded with a wide, faintly glowing ring of undecipherable outlines. From the ring, the contours of a cylinder shined through. The cylinder united the cones. Suddenly the ring became thick and opaque, whirling around the middle of the ship like the wheel of a turbine . . . the ship was larger than the Tellur.[90]

A comparison is made between the Tellur and the Alien ship.

> The strange starship's belt of blue fires was really completely white in color. It did not have a mirrored metallic surface designed to reflect all types of cosmic radiation, as did the Tellur, but glistened with the clear whiteness of mountain snow. Only the central ring continued to emit a weak blue light.[91]

The two ships were drawn to each other by the gravitational pull the ships possessed by virtue of their being the only objects in close proximity in Space. This phenomenon proved that the ship from an unknown world was, like the Tellur, made of matter rather than anti-matter.[92]

Gadgets are another use of decorative material which serve to characterize a way of life, delineate the extent of cultural achievements, or simply show some original inventions. At the same time, gadgets may have some entertainment value, or be accommodative in nature. Some are essential to description of the life style of a particular era or civilization such as a galactic clock. Efremov describes personal robot-assistants--SDFs--initials of the Latin equivalents for "Servant, Defender, Carrier." The SDFs are set to respond to their respective

owner's biocurrents; the owner is the only person who has control over his private SDF.[93]

> It is only a machine, which serves as a cart for personal things, a carrier, and a secretary and guard. The machine is absolutely harmless, but it is so arranged that a bullet, shot at the robot, will rebound with the same force and the hit may evoke a pole of repulsion . . .[94]

The SDF has nine legs,[95] is small enough to be stored under the bed,[96] projects two-way communication[97] and pictures and films on a screen,[98] sends ultra vocal sounds,[99] has ion rays and electric power that can be used for tanning and massaging,[100] detects poison fumes in the air,[101] and detects hidden spy bugs:[102] it can overcharge itself and explode on command,[103] and can be converted into a personal hovercraft or a plane.[104]

Aboard starships as well as on Earth there are pulsating hypnotizers and nerve stimulators,[105] concentrated and artificial foods,[106] vitamins and hormones produced from stone coal,[107] synthetic food, automatic factories, which produce artificial meat, milk, butter, caviar, and sugar.[108] There are pills to stimulate alertness--PV,[109] immunization pills against the food or air of foreign planets--IGN-102,[110] pills to change physical color and appearance:

> [The faces of the navigators] looked pale in comparison to the dark-complexioned people of the planet Jan Jax and [They were] recommended to take the pill for tanning. . . . --Maybe it will be necessary for us to change the color of our eyes.[111]

For comfort and for aesthetic appreciation, there are such things as: television phones,[112] parabolic television screens,[113] stereo-portraits,[114] stereo-projectors TVF's,[115] walls that become mirrors,[116] holograms,[117] plants from the planet Mars,[118] and galactic clocks:

> The clock face of the galactic clock had three concentric rings marked in subdivisions. . . . News was broadcast by galactic time--every one hundred thousandth of a galactic second or once every eight days or forty-five times a year according to Earth time. One turn of the Galaxy on its axis formed the galactic day.[119]

Efremov's gadgets, though not too original or phantastic, give a good example of the use of gadgets in science fiction. Formerly individual gadgets formed the theme around which the action of a story revolved. In modern science fiction, as Efremov shows, gadgets are for the most part of a secondary nature, forming the background to the action of the story.

CHAPTER III

THE SYNTHETIC FUTURE

1. The Noosphere

The anti-utopian literature[1] of the first half of the twentieth century[2] led some writers of the second half of the century to reexamine the basic premises which had led utopian literature to the development of pessimistic themes. It was realized that the utopian models which prevailed after the eighteenth and early nineteenth cneturies (Saint Simon, Prudon, Blanc, Owen) were all based on either the simplistic models of a Newtonian exact machine universe, or that of an organism. These models, moreover, were found to have been vulnerable to the decisive impact of Darwinian and Freudian theories.[3] The concept of "struggle for existence," implying a savage quality in man's biological nature, and the theories of "subconscious repressions" and "neuroses" proved that man and his society were unimaginatively more complex than it had been assumed before. This realization brought a new turn in the utopian novel during the first half of the twentieth century.

Writers began to reevaluate the principles of Darwinism and Freudism only towards the 1940's. Psychologists, historians, philosophers began to search for a new approach to the problems of the human psyche and the concepts of "progress."[4] Ivan Efremov was one of them. He sided with the not too original German romantic approach, whose proponents held the theory of evolution as a scientific doctrine, and expected that man's next evolutionary step will lead to the heightening of man's spiritual potentialities, which would be realized through physical causes.[5] Efremov solved the Freudian dilemma by agreeing, on the one hand, that the most important psychological problems have to be solved by research in motivational psychology. On the other hand, Efremov disagrees with the psychological methods of behaviorism, since the methods are "short circuited" with Freudism, that is, both methods too easily justify human behavior by attributing "atavistic instincts, ancient psychological remnants, and subconscious emotions . . . showing, in the process, that every one of us is low and bad and that there is in everyone of us a killer whom we want to suppress."[6] This is why, it seems, we all possess the primeval wish to kill, to destroy, to liquidate. Efremov strongly disagrees with this approach in psychology, feeling the method to be mainly a "pseudo-scientific

discussion"[7] since the approach is based on a minimal amount of scientific data and questionable unjustified premises.[8] He writes:

> [The behaviorists and Freudists] accepted the dynamics of the psychological process as being static, considering such particular essences as the "libido" or the "mentality" as constants. Actually there exist only impulsive flashes, which can be easily coordinated by training and exercise.[9]

Efremov suggests, it is necessary to develop a psychological science which would support itself on a "philosophical purport,"[10] a dialectical method. The philosophical purport will then direct man to the correct way of developing his tendencies, analyze his mistakes, and establish their causes. Man will then supposedly, be able to lock himself away from all that might be amoral.[11]

Efremov realizes such a position poses some questions for psychology. What are the criteria by which one can judge what is good and what is bad? Where does freedom stand in such an approach? What problems, e.g., in regard to civilization, ethics, are related to such an approach? Efremov realized that man is capable of doing noble acts and feats for the general welfare, expressed in scientific research, discovery, art, etc. Such acts should be seen, however, as being quite distinct from a case in which someone permits himself to solve the questions of life and death for others, while considering himself,

competent enough to risk an experiment or direct research projects and yet at the same time considering himself independent of rank and call. Such actions and feats are amoral. These kinds of experimenters should be psychoanalyzed, and they themselves should try to determine those psychopathetic causes which made them inhuman.[12] Man certainly is a creature of passions as well as of reason. He has "creative ecstasies" as well as a fanatical fascination for some preferred pursuits brought about by his genial ideas.[13] What determines the criteria for this is the love of man, "his care for his neighbor, . . . happiness of beings similar to himself. . . . All else . . . is, more or less, beclouded with lustful tendencies, screened by practicism, diluted in beautiful words of egoism."[14] Love of man is primarily an outgoing concern for one's neighbor. Efremov makes up a maxim: "Find in yourself whatever you attribute to others."[15] Love of man, however, is possible only in the context of the social behavior of man. Efremov believes that love has to be absolutely free. This can be completely possible when there is freedom from economic necessity. A free family presupposes, as any other freedom, responsibility on the broad plan, the plan of mankind.[16] The condition which will permit such a family can be achieved only in a post-industrialized society.

> I do not doubt that in the future material wealth will be produced in a closely knit ring of technology--automation, robots, electronic-computing machines--and Man will completely give himself to creativity. It is probably the only outlet from the dead end of our material civilization.[17]

Efremov states that technological man has now at his disposal potentialities and powers which man never possessed in the past. Such a condition inevitably places him at the crucial crossroad where he has to make a decision whose consequence will lead either to a better future world--a utopia--or to its opposite--dystopia, which is for Efremov synonymous with perishing. It can be assumed that Efremov believes that the condition known as the Mania Contradiceus[18] will have to comply with one of these choices. The conditions in the world today require much more care and planning by each individual.

> This demand [to foresee] exists even more because of the awareness one has that never in all its history has the planet and all mankind been subjected to such serious danger as promised by the latest scientific discoveries, its technology, and the possibility that this power might be found in the hands of irresponsible politicians and the ignorant.[19]

Efremov wants to confirm his faith in the hope that there is a way out for humanity. He wants to believe in the future, to believe that danger can be done away with, that mankind can and will be united, and that even the least possibility of war will be removed.[20] Efremov believes that man has yet to begin his true destiny. Man has barely stepped out on the platform from which he can

finally rise. It is only in this awareness of his possibilities that Man can base his hopes.

Nature works and develops according to the laws of chance--a game of dice played for billions of years. Man can overcome this game and rise above it by crossing the step from a biological development based on a biological struggle to a new sociological level which confirms that "history is the development of man himself.[21]

> [Nature's] method was even noticed in ancient India seven thousand years ago and was called "Raša-Lila," the game of gods. Our task is to find a new way out of nature's game of chance. Only by uniting all sides of human knowledge has it seen possible to rise above this game--this is higher than the gods of India.[22]

If civilization is viewed to be only the sum of the technical achievements influencing existence, then civilization is certainly of short duration. Efremov sees civilization as being primarily the growth of spiritual life which allows "no boundaries to growth and progress."[23] Efremov calls this spiritual life the "noosphere," the sum total of all that man created with his knowledge, art, and dreams.[24] If civilization transmits its cultural inheritance from one generation to the next, Efremov suggests that methods and means are then necessary to establish a normal development of the noosphere. Society will then develop rationally and normally.[25] A short retardation on the path leading forward will be threatened by death, because it will mean to stop spiritual life. This stop

eventually renders more difficulties than any material stop."[26] Efremov notes that the gradual falling away of true science and art during the Roman Empire led directly to the final collapse of the Empire.[27] Societies usually disintegrate after this:

> Inventing the mythical image of the King of Evil, Satan, Man becomes that image himself, particularly towards animals. The more extensive the knowledge, the stronger evil can be made. [In the pre-communist societies] methods were devised to create biological monsters, such as brains separated from their bodies and living in solutions or certain sections of man connected with machines.[28]

The above quotation talks about knowledge. What kind of knowledge is necessary? How is knowledge to be used? Efremov believes that the basic steps in science and the required components that make up research can be found only through a synthetic knowledge and a general public education. Marxism proves, Efremov underlines, that science without a corresponding philosophy cannot be "power-directed towards the establishment of a better society."[29] The separation of science from philosophy will reflect disillusionment in science, as it is now evident in the West.[30] Of course the disillusionment is not in the potentialities and power of science itself nor in "the possibilities of new discoveries, new chemical combinations, cosmic flights, etc., but rather the disillusionment is in science's benevolence, in its humanism."[31] To find the border line between humanism and inhumanity in science (since the two are interwoven) can

only be achieved by a "very clean and honest person."[32] Inhumanity exists, Efremov believes, in experiments on animals and prisoners.[33] "Why not proceed through the psyche, which is wealthier and gives a wider field than by using, for example, chemical means."[34]

> Why not protect the psychical atmosphere from anger, deceit . . . from nebulous thinking and shallow words? Even the most important scientific theories in the spiritually-moral sense are found in the level of Stone Age reasoning, if they are not transformed into a conscious wisdom of humane morality.[35]

A culture based on a spiritual-moral union can exist permanently, or at least "thousands and millions of years--as long as the galaxy itself."[36] Mankind will simply look after the "genofund" to make sure that it does not exhaust itself.[37]

> Nature concerns itself endlessly about the production of fully developed types. How? By dual sex multiplication, with a constant influx of fresh genes from somewhere inside. And one need not doubt that the crossing of all races on Earth will guarantee Earthlings sufficiently long existence.[38]

2. Sociosphere

Efremov believes that the rising success of science fiction during this century cannot be attributed only to chance alone. The rapid development of this genre must certainly fulfill some fundamental need in the "historical development of mankind at a stage when there is a comprehensive inculcation of science into the mode of life and the psychology of contemporary people."[39]

This is why Efremov disapproves of the new tendencies which have appeared in Western science fiction and recently in Soviet science fiction, as well. Primarily, he objects to the assertion that science fiction, in order to become "pure," should free itself from the epithet "science," supposedly because science has a restraining quality on the phantastic genre.[40]

> Theoreticians of literature . . . [and] authors have held during the past several years arguments which were to determine the boundaries in the use of science in science fiction. Many have asserted their right to have any fantasy, free from the fetters imposed by science. This interpretation led . . . science fiction to blend unnoticeably with the children's story, the grotesque and in general with any invention crossing normative everyday literature.[41]

Efremov views this movement in literature as merely the result of the loss of power of religion.[42] Science would fill the spiritual gap and inevitably bring about the appearance of science fiction. It follows, then, that to take science out of phantasy would mean to turn the clock backward to the fantasies and stories of the pre-religious epochs.[43]

Science fiction is a "particular mirror of the development of science--a symbol of an all-growing scientific knowledge of the world."[44] Scientific achievements and the changes they bring in nature, society, and man form the "essence" of real science fiction.[45] Efremov believes that the influence of science on the development of society will inevitably lead to a psychic cognition

of the world in the feelings and life of man. Efremov adds that, without a doubt, in this sense "science fiction provides a direct contact with social problems and thus becomes sociology."[46]

Science fiction as sociology gives the reader and the narrowly specialized scientist an overall view of the conditions and the effects brought about by accumulated knowledge about the world. In such a perspective, phantasy can and will give advice to the individual branches of knowledge. Science fiction has foretold the appearance of the submarine, the airplane, and television and is working on lasers, quasars, robots, cybernetics, etc.[47]

Efremov believes that science fiction on equal terms with philosophy, sociology, and futureology can interpret the universe.[48] This potentiality proves that science fiction has to be intelligent rather than simply "dangling in search of some unusual subject turns, implausable inventions.[49] In his view, science fiction formerly applied science with a popularizing function; now science is rendered to artistic-scientific literature a much more serious philosophy of nature. In this latter stage science fiction will unite the constantly separating specializations, as well as the contemporary branches of science.[50] The further broadening of such a science fiction will, in Eframov's opinion, finally raise phantasy

to the point where it will take over the whole of literature, which by then will be at a level suitable for the average thinking person, "who will have a scientific foundation in psychology, morality, and the understanding of the historical development of society as a whole."[51] This is why Efremov requests the writer and the reader to dedicate their inspiration not merely to stories or to fruitless dreams, not even to technical prophesies, but rather to dedicate their inspiration to the widening of the frontiers of Man's knowledge of the world for the sake of man, and thus create a future on this basis.[52]

3. Education

Efremov holds that the socio-economic problems of the future will be tied to psycho-ethical problems.[53] The solutions to these problems must be found only through human strength brought about through Communist education:

> Communist education is not a social superstructure. . . . Such an education will permit us to raise the productive power of the future society many times. How? First, by an absence of multiple staged systems of controls. By placing bounds which limit enterprise and initiative, we invariably destroy the independence of thought--flights of phantasy in embryonic stages.[54]

Efremov believes that a whole series of barriers can be reduced by self-control, self-improvement, and self-education. And these can be achieved through the realization that man must limit himself--avoid indulgence.

Man must find some means to limit his tastes, for "a certain amount of asceticism is not such a frightening evil, as many assume it to be."[55] The purpose for these self-imposed limitations is to transfer man's needs to ever higher spiritual levels.[56] Efremov notes that man will get along easier without toys, clothes, and cocktails. By transferring a body into an image of word, sound, and color,[57] man achieves creativity--a "higher" need which never will have limits and which is much more fulfilling.

> How can we limit the yearning to find in the universe living, thinking beings? Having just reached by thought the Andromeda nebula, I unintentionally strive further. I now want to grasp the galaxy whose light reaches Earth through the monstrous distance of 150 million parsecs. Who would not want to free himself from Earth, from the solar and galactic limits of gravity? Who is undisturbed by ideas of outer, unchanging forms of existence?[58]

Man stands on the edge of infinity, infinity in the sense of the numberless possibilities of worlds, of the great quantity of phenomena "resulting in the boundlessness of knowledge."[59] This limitlessness of possibilities constitutes Efremov's view of creativity as the source of satisfaction of Man's spiritual needs. The education of Man, that is, the development of his creative potentialities, must of course begin in childhood. Following the classic Marxist plan, Efremov believes the education of a child should begin when the child is separated from the narrow, limited, little world of his family, so that he has the chance to gorw "in a comrade collective."[60]

The latter is an enlarged family-society, a prerequisite, an absolutely inevitably condition of communist society. Efremov considers the narrow family as merely an outmoded economic cell of a class society, which is an obstacle to the progress of Man. The first task of the future society will be to establish a dividing line to separate the child from the family in the external world. This will permit the child to think of himself as "some kind of a privileged unit, claiming certain particular rights. Aggressive characters with paranoidal tendencies are so frequently brought into the world, that . . . we have to constantly check the child by constantly showing him whether his behavior is positive or negative so that later . . . he will not blame himself for everything and will not develop a depressed constitution."[61] Efremov adds that people then will not become individualists since they will know from the first that their parents are every man and woman that makes up the communist society.[62] During a long trip through Space (Cor Serpentis), the cosmonauts of the future may expect to return to Earth several generations after they left it; but they remain assured that they will meet people who are similar to the ones they left behind.

> We people on the "Tellur" have lost all our close ones on Earth. But there in the near future we are awaited by dear people who are no less close and who will have knowledge and have feelings even more, even brighter than our contemporaries whom we left behind.[63]

Efremov describes the communist education system during the Era of the Great Ring in his novel The Andromeda Nebula. The education system is divided into four-year cycles, with each cycle at a different geographical location. The transfer of school children from location to location every four years gives variation to the psyche, which otherwise becomes tired or dull from the environmental monotony.

The student finishes these cycles of education by the time he is seventeen. He then enters a three-year program called "The Herculean Exploits,"[64] where studies are continued in constant contact with consulting adults. (During the school years, the older students also tutor younger ones.) It is then possible to better determine the aptitudes, capabilities, and interests of each student. After the Herculean Exploits, the student can follow two more years of independent studies in his chosen field. The prolonged life of Man permits him to accomplish studies in five or more specializations during his life, thus allowing him to change type and location of work. The additional studies and training are always accompanied by consultations with and suggestions from a more experienced adviser. All achievements by each student are controlled, in this way allowing encouragement or discouragement, depending on the total results.[65]

All schools are carefully chosen for their geographical location. School number 410 of the third cycle is located in southern Ireland, not far from the sea. The landscape is significant in its variety--rolling hills, fields, vineyards. The classes are held either in doorless buildings or outside these buildings. In order to further research in the subject under study, the lessons are often replaced by a variety of field trips[66] or special television programs which add video, audio, and sensory explanations.[67] Automation does not seem to infringe on the direct human teaching in the classroom.

Efremov develops the idea that the most important side of training and education is the development of a keen perceptability of nature and a union with it. Dulling one's attention to nature will retard the development of the person, for when man forgets how to observe, he then loses the capability to generalize.[68] The potentiality to learn is the most precious capability of man in any epoch. Efremov foresees that in the future communist world education is actually understood as discipline. As such, education can prepare the child for the difficult path of man. Of course, a foundation is present in the inborn characteristics of the individual, but these characteristics remain in vain without careful refinements "on the soul." A teacher can refine these inborn characteristics.[69]

In education, students receive only the latest information, old concepts and approaches are rejected.

> If the new generation will repeat and follow old concepts then how will a movement ahead be guaranteed. This pulsation of generations--with a step ahead and nine-tenths of a step backward [backward, while the new students grow and learn]--is for Man the most difficult biological law, the law of death and rebirth.[70]

Therefore, the most important thing in the study of history is the study of human mistakes. This is the subject taught to students in the Third Cycle before they undertake independent studies.

> Preparing oneself for independent activities, the young women and men passed over with great interest the history of mankind on Earth. Most important was the study of ideological mistakes and the wrong direction taken by the social organizations during the time when science was used to control the destiny of nations and peoples, at first partially and then totally. The history of the Earth was compared with many other civilizations on far away worlds of the Great Ring.[71]

Similarly, Efremov believes that when studying science one should not simply enumerate great discoveries of the past but be aware that the history of science also has failures and reverses--which might explain why some of the most intelligent scientists had failures in their research and how the reputation of others led scientific research to mistakes.[72] Science as a means of educating the individual is one-sided because it disciplines the reasoning process, trains one to think logically and with economy of thought, and teaches one how to proceed

directly to the goal, rather than scattering about.[73] Thus, science impoverishes the many-sided feelings of people toward the world.

Information accumulates very rapidly and Man is limited in the assimilation of this information. In conscious life a person can assimilate not more than ten to twelve thousand books.[74] The purpose of education is not to stuff children "with much useless evidence."[75] Education should be directly related to the psychology of the child in order to protect his dignity, that is, to care for his psychological atmosphere.[76] This is also an essential factor in the education of feelings. Efremov adds that the universal growth of education is what most influences the path of history. But this education has to be not so much technical as humanitarian and philosophical.[77]

4. History

Efremov's Communist world situated two thousand years in the future is developed through science fiction by the logical sequence of events which account for the elapsed centuries since the last year of the "Century of the Disconnection" (probably the late 1900's A.D.) during the "Era of the Disunited World." Efremov describes the Century of the Disconnection as a century in which there existed numerous countries with conflicting economic systems and ideologies. But it was also a century during

which "man began to understand that the problems in the world came from elemental forces." At that time some people finally began to realize that all the power and the future of mankind depended on "labor, the union of all the efforts of millions of people, free from the oppression of man, to construct life upon scientific foundations."[78] These people understood the basic laws of social development: the dialectical path of history, the necessities for the education and for a strict social discipline.[79]

To describe the pre-Communist social events that led to the utopian era, Efremov generalizes contemporary world events in politics and describes these events as history. During the Century of the Disconnection the world found itself separated into two camps, the capitalist and the socialist. With the discovery of atomic energy, the defenders of the old world in a last resort for survival would have precipitated "humanity's greatest possible catastrophy."[80] Efremov describes the final transformation into a Communist world system as one which did not come about with ease. One of the greatest problems was caused by the accumulation of hostile propaganda during the ideological confrontations of the Century of the Disconnection.[81] The complete transformation of the world was actually brought about by a "root change of the economy"--a complete change in the

new economy. This was possible by training the social consciousness of every person.[82] Gradually and inevitably the newly organized life spread over the whole earth and the "most diverse people and races became one friendly and wise family."[83] These factors finally gave way to the next era, "The Era of the Wise Union" composed of four centuries: "The Century of the Union of Countries," "The Century of Different Languages," "The Century of the Struggle for Energy," and "The Century of the Common Language." During these centuries achievements were gaining momentum. Labor was soon understood to be the essential ingredient of happiness--"labor in the full measure of strength is creativity, corresponding to inborn capabilities and tastes which are diverse and changing from time to time--a necessity for man."[84] With the development of cybernetics, Man was able to educate, cultivate, and physically train himself on a totally new scale. He was capable of change, finding satisfaction in all the diversifications of life. Man now had the joy of creating and discovering the mysteries of nature. Art developed and became apparent in all walks of life.

The following era, "The Era of Common Labor," was also composed of four centuries: The Simplification of Things, Reorganization, The First Abundance, and The Cosmos. Geography, climate, food production, and travel,

"man finally ceased to be the slave of things."[85] These developments, in turn, brought about the advent of the "Era of the Great Ring" which is described in detail in Efremov's science fiction novel The Andromeda Nebula. The Era of the Met Hands emphasized the meeting with other extraterrestrial intelligent beings during three hundred years--The Hour of the Bull.[86]

5. A Synthetic Psychology

The description of perfect societies and the elaboration of new goals for humanity are comparatively simple tasks in portraying science fiction utopias. The difficulties arise when the writer has to elaborate plausible proofs for that initial psychological push which would accelerate man towards global cooperation--that elusive simple act of will by which supra-conscious people finally take steps to organize a utopia which does not lose its way as time progresses. The choice made by each individual and the existing climate of social psychology are particularly crucial since man at this critical time controls the environment and his destiny through science and technology. In The Hour of the Bull, Efremov explicitly contrasts two societies which have made opposite decisions at the crucial moment in their social history. He shows the question is essentially one of survival or extinction: "Either subject oneself to social discipline, long training, and education or perish--other

ways to live on our planet, even though nature is generous enough, simply do not exist."[87] Man has the freedom to choose, but behind each choice there are proportional responsibilities.

Efremov realizes that he has to make an analysis of the essential attitudes that lead an individual or society to a particular choice. He finds that there are basically two possible outlooks on life. First there are the "unclutured people" who dream about a return to nature, to the freedom of primitive societies and relations. Efremov finds that:

> Sorry philosophers, who thought about the return to former items, to primitive nature, did not understand and did not love nature in the true way; if they did they would have also known of nature's merciless cruelty and its inevitable destructiveness toward everything that did not submit to its laws.[88]

Such onesided philosophers are in Efremov's opinion "infernal." In the novel The Hour of the Bull, Efremov analyzes the nature of this infernal outlook and proposes a solution.

The theory of infernality is a modified version of the simpler concept of "entropy," (concept related to the principles of thermodynamics; a measure of the order of a system; order decreases with increasing entropy,) which Efremov developed in his novel The Andromeda Nebula. The concept "inferno" is borrowed from Dante who wants to explain, as Efremov notes, the "horrifying

essence of the appelation 'inferno'--its hopelessness."[89] The inscription at the entrance of Hades, "All Hope Relinquish, You Who Enter Me," reflects the important characteristic of hopelessness which was thought out by tortured man.[90] Efremov's theory of infernality states that natural selection leads directly to hopelessness (in infernality) because the method of natural selection leads to perfect types merely by a simple game of dice, i.e., blindness, by chance. This is seen when life forms, passing through trillions of transformations from obscure sea weeds to thinking organisms, found themselves in the inferno.[91] Being subject to natural selection, man finds himself in a double inferno because he possesses a material self and a "soul."[92] At first man tries to save himself by dreaming about returning to nature; this is usually depicted in stories about the first paradise. The infernality of the soul, Efremov writes, expresses itself in the primitive instincts which lead man to think that he is an individuality.[93] Man has a memory, strong feelings, the ability to understand the future, and like all Earth creatures he is condemned at birth to death. Only by outweighing his instinct of self-perfection can he make the step towards social consciousness.[94] Efremov emphasizes that it is through the discipline of one's desires, and one's thought--just as by the training of one's body and by

the study of the laws of nature, society, and its economics--that the personal will can direct itself to sensible knowledge. Then, when a man says "I want," it will be understood to mean "I know that it is allowed,"[95] and "I want it so" will be synonymous with "it is so necessary."[96] The "higher, cleaner, and nobler" man is the more his suffering will be removed.[97]

6. Government

Society is ruled by the "will of mankind" when it is composed of responsible citizens. Efremov states that the "will" is expressed through the sum of the decisions.[98] In the Communist society, all the big questions are openly studied by thousands of scientists in thousands of institutes.[99] The results are then brought forward as universal information. If a particular question should arise, appropriate institutes coordinated by the Council of Economics seek out the solution.[100] If extraordinary conditions should arise, a competent councilman takes power in the respective situation--Economics, Health, Honor and Law, Stellar Navigation. This direction is constantly verified by the Academies.[101]

The basic governing departments are similar in arrangement to the "human brain," with its investigating and storing centers ("centers of feeling") and associative centers (councils).[102]

> The Council of Economics is in the center. Leading from it are straight connections to its consultative bodies; ASH--Academy of Sorrow and Happiness, APP--Academy of Productive Power, ASF--Academy of Stochastics and of the Prediction of the Future, APL--Academy of the Psychophysiology of Labor. There is a side connection to an independently active body, the Council of Interstellar Travel. From there, direct connections extend to the Academy of Directed Radiation and to the outer Stations of the Great Ring.[103]

The Council of Economics controls the center of the government and reapportions the actual potentialities of the social organism.[104] In the Academy of Sorrow and Happiness, for example, calculations are made to determine the level of sorrow and happiness in the life of separate individuals. The Academy does this by investigating the amount of sorrow an individual has and by analyzing the qualifications of groups of people. The Council of Economics then traces and analyzes the apparent changes that occur between sorrow and happiness in the stages of human historical development and measures whatever varying qualities can be found in the emotional feelings of total masses. The qualities are processed by methods of large numbers, stokastics, until significant regularities appear in the form of tangible patterns[105] that can be controlled. The council always tries to get the "best showing," since with the growth of happiness, or at least its balance with sorrow, there is guaranteed development during which society moves ahead.[106]

Efremov underlines in his novel The Hour of the Bull, that, inspite of the inevitable growth of goodness, sympathy, and kindness in the Community society, there always remains the chance that the millions of years of infernal suffering accumulated in the memory genes could reemerge in an individual in the form of archaic psychological patterns and behavior. A person with such a psychology is capable of inflicting fatal damage to individuals who have long forgotten former social dangers. This is why the communist system has such organizations as PSOG, psychological surveilance, together with LTFI, lattice transformation of the individual, the two being defined by the Council of Honor and Law.[107]

7. Material Achievements

The material achievements in Efremov's science fiction utopia embrace all sides of Man's life cycle. The planet has been completely reshaped in its geography climate and economy. In The Andromeda Nebula, plans are discussed regarding the need to tilt the Earth's axis to accommodate further improvements in the control of geography and climate.[108] Automation has reached a pinnacle of sophistication freeing Man from certain physical tasks. At the same time, Man and animal have undergone genetic transformations giving each new strength and potential. All these material achievements can be divided into three main categories: geography, automation,

genetics. All three categories, however, are organically interrelated, forming one interdependent whole.

Whether a utopian society is organized on an island or embraces the whole planet the prerequisite for successful existence depends largely on favorable climatic conditions. Weather conditions might sometimes be tamed by methods ranging from rain dancing to physically tilting the Earth's axis into a more favorable angle. In science fiction utopias, controlled weather conditions are a practical achievement which has to be made scientifically plausible. For example, the science fiction writer finds through scientific papers and research that some critical weather patterns of a planet can be modified by melting the polar ice caps, but he might neglect in his zeal the geographical consequences of such an experiment, that water will rise 500 feet throughout the planet covering most of the habitable surface of that planet. In science fiction such an experiment would lack imagination and border on fantasy.[109]

In his novel The Andromeda Nebula, Efremov relates that during the Era of Common Labor (ECL) there was a complete redistribution of the habitable and economically worthy zones on earth. Uninterrupted lines of city dwellings are concentrated along the shores of the warm seas at thirteen degree latitude of the northern and southern hemispheres. These zones have very mild climates without any winter seasons.[110] The Mediterranean

area is the most populated area. The subtropical belt tripled in width.

These weather changes materialized during the Century of Reorganization when artificial suns were hung over the polar regions.

> We greatly reduced the ice caps, which were formed on the Earth's poles during the Quanternary epoch of the ice age and changed the climate of the whole planet. The water in the oceans rose seven meters and the atmospheric circulation in the polar fronts radically reduced and weakened the rings of trade-winds drying the zones of the desert on the border of the tropics. Hurricane winds and all types of storm weather ceased completely.[111]

To the north of the northern populated belt gigantic zones of meadow lands and steppes were found "where countless cattle grazed."[112] In the southern part of the northern hemisphere and in the northern part of the southern hemisphere, gardens abounded where deserts had formerly stood. The Sphinxes throughout the Egyptian deserts were covered by transparent domes.[113]

> Up to the sixtieth parallel there were warm steppes and fields, and the forests of the moderate belt crossed the seventieth latitudes.[114]

Similar climatic conditions exist on the parallels where the Irtish and the Ob rivers meet.[115] At the same time, since three-quarters of the Antartic ice had melted, the land revealed a treasure house of ore and mineral wealth.

Melting the ice caps, however, did not by itself guarantee a balanced weather condition. Geography was also to be reshaped.

> Still before this capital change; of the climate, huge canals were dug and mountain chains were cut to balance out the circulation of the water and air masses on the planet. Permanent dielectric pumps helped to water even the high mountain deserts of Asia.[116]

The seas and oceans were unpolluted, although in some remote corners of the ocean bottom latent "seeds of evil life" did exist; the oceans were cleared from "predatory sharks, poisonous fish, mollusks, and dangerous meduzae."[117] Where formerly there were swampy defoliated taigas and frozen land, now there grew giant forests tended by machines:

> The Siberian cedar and American sequoia's [gigantic] red trunks rose splendidly as a fence around the hills covered with ferroconcrete caps. Steel tubes ten meters in diameter crawled from under the caps and curved over the watersheds to the nearest rivers drawing them completely into their open funnel mouths. The monstrous pump wined deafly. Billions of gallons of water speeded through the volcanic chimneys where the diamonds were found, the water whirled and raged as it washed the clay away and then found its way out again leaving behind tons of diamonds on the grids of the washing chambers.[118]

The whole planet is crisscrossed by the Spiraled Road which connects all continents, including Antarctica, by gigantic bridges.[119] Electric trains constantly move over this Road at speeds reaching two hundred kilometers an hour. Hundreds of thousands of people travel the Spiraled Road moving quickly from the habitable zones to the whole surrounding countryside of steppes, fields, and mountains, where no permanent cities are established. The future people like to travel, but since the population plans its life, the people do not have to race along the

Road at fatal speeds. For emergencies special ships are used which reach speeds of several thousand kilometers an hour.

The automation of all factories and energy stations makes it unnecessary to build a town or any large habitable area in the vicinity; a few houses suffice for the handful of men on duty as observers, mechanics, and fitters.[120]

Inventions such as the condensation of electricity[121] led to the development of high-capacity accumulators, and their compactness led to the invention of powerful electromotors.[122] A new series of semi-conductors, which integrated the most complicated nets of weak currents, made it possible to develop self-guiding cybernetic machines.[123] This gave rise to the development of detailed standards which permitted the creation of anything from a comparatively few basic building units. The self-regulating cybernetic units are based on the principle of a live organism; that is, all distinctive characteristics, in a cell are made up from a comparatively small number of elements in the same way as the great variety of living organisms are made up of a small number of different cells, e.g., "the cell consists of albumins, the albumins from proteins, etc."[124]

In the novel The Andromeda Nebula Efremov develops four major electronic brains which serve the needs of

every individual on the planet. The "Prophetic Brain" is composed of "brains" located in different parts of the planet. The "Lowest Determinator" is situated in the southern zone of the Australian sector, while the "Brain of the Highest Determinator" is located in the Indian sector of the northern zones.[125]

> They were gigantic electronic research machines of the highest class. They were able to solve almost any problem not beyond the ability of elaborate known mathematics. This planet had four such machines each specialized in a different way.[126]

In the novel The Hour of the Bull, the cybernetic systems are extended and ameliorated. Numerous institutes built on the surface of the planet are all connected by underground labyrinths of memory machines which store all the information gained on the planet.[127] These cybernetic units are used in the most complex experiments, such as to compute social factors, to measure the amount of sorrow and happiness, and to administer justice.

> The dream to measure correctly [the value of] authentic truth [concerning various facets] of human life finally became possible after the electronic computers were invented. Then it was possible to evaluate both sorrow and happiness for the harmony of feelings and duty.[128]

Combining these achievements in cybernetics with a new source of subnuclear energy (Ku, F, and Anameson)[129] resulted in a complete revolution of the whole economic base of the society. Automatic factories for the production of artificial meat, milk, butter, caviar, and sugar[130] and the artificial production of skins and

leather [131] were made possible by completely breaking down and reconstituting the basic nutrions.

> Long ago, after the discovery of the artificial production of carbohydrates the sugars were obtained artificially from sunlight and carbonic acid, we stopped growing sugar producing plants. But the economic production of some totally nutritious proteins is yet to come. So in the mean time we cultivate plants and mushrooms rich in proteins on land as well as in colossal ocean fields of algae.[132]

Utopian technology is finally able to produce artificial food such as vitamins and hormones from coal. Agriculture produced only proteins; all else is synthetically feasible. Automatic factories, invisible in their geographical surroundings, produced food below the surface of the earth.

> Flat, transparent cups of radiation absorbers for the production of proteins formed only a small part of the huge underground structures in which, under unvarying temperatures and pressures, streams of amino acids were circulated. The broad towers of the sugar factories resounded quietly like an echo from a faraway storm. This colossal quantity of air was pulled into the receptors and separated it from extra carbonic acid.[133]

There were no farms in the Communist world, and since there was no longer slaughtering, even for experimentation in biology,[134] the cattle--a crossbreed between yaks, cows, and buffaloes--simply roamed the fields.[135]

The combination of the science of cybernetics and biology gave way to "embriotecs," a method which works on the principle of the growing living organism. Embriotecs was used for the assembly and construction of all complex systems.

> It goes without saying that the molecular structure of the living organism, effected by the hereditary cybernetic mechanism, was immeasurably more complicated. Living organisms, however, could only grow in the conditions provided by warm solutions of ionized molecules while embriotec units usually worked in polarized streams of electricity or light or in a magnetic field.[136]

Embriotecs was used to build Space platforms, new means of transportation, and dwelling places for the population. It was the highest technological achievement of Efremov's utopian automation.

A ride by train along the Spiraled Road disclosed the following:

> There was a closed silicolloid cap corridor along the roofs of the great coaches. Mechanics walked along it from end to end watching the panelboard. . . .[The passengers] rose along the winding staircase to the platform to walk through the top corridor into a large booth opened onto the railing of the coach. In a crystal ellipsoid seven meters above the railroad bed, separated by the high pyramidal cap of the electronic guidance robot, two pyramidal cap of the electronic guidance robot, two mechanics sat in armchairs. The parabolic screens of the television permitted everyone to see on both sides of the train. In the roof, the two trembling whiskers of the warning antenna gave data to the central system on the condition of the road fifty kilometers away.[137]

The utopian home is automatically cleaned, beds pulled from the wall, and the air in the room is adjustable to various fragrances, such as "the splash of the sea."[138] Video telecommunications connect each house with all the information systems on the planet at the push of a button. Everything is built with esthetic taste. The hall of the Palace of Information appears like a Gothic church with its high columns. The slanting rays of the sun slanting

down from high windows crisscross at the middle mark of the hall creating a radiance at the upper section of the hall and a soft twilight below.[139]

Genetic engineering is the most complicated factor of material achievement in the Communist society. Efremov writes that once man stood on the road to Communism, he could not allow himself to return to where he came from. The Council of Economy keeps population growth under control. To keep a comfortable life and stability in the exploration of resources,[140] the Council tries to compute and foresee the fluctuations in the successes and failures of the "cosmic cycles,"[141] their computers makes it possible to select the best qualities in Man.[142]

> With the help of these very machines we accomplished a meticulous assortment of people. The realistic struggle for the health of posterity and the purity of perception was begun only when we placed teachers and physicians on the highest level of professions on earth. We introduced dialectical training--on the one hand disciplinary and collective, and on the other softly individual.[143]

After 500 generations of Communist society,[144] Man still found mutations and hereditary defects which cause people to deviate from the normal creative orientation.

> During the great mixture of races and peoples which created one planetary family, there suddenly appeared from certain depths of heredity some of the most unexpected traits of character which had belonged to the distant ancestors. There appeared unusual psychic deviations, acquired during the great calamities of the Era of the Disunited World when man was

> not cautious in his experiments and in his use of nuclear energy and brought destruction to the offspring of multitudes of people.[145]

Efremov sees that the psychological factor is closely tied to a long line of hereditary factors.[146] Lines of ancestry and the hereditary mechanism structures are meticulously analyzed and studied in order to repair the hereditary mechanism from the consequences of radiation. To perform the delicate analysis it is necessary to carefully train the new Man. Efremov believes that during the Communist era an irreversible time passed when society was somehow satisfied with haphazardly trained people whose mistakes were justified by heredity. In the Communist world every badly trained man is a lesson to the whole society.[147] Biological science undertakes the task not only to clean and repair the human organism from the consequences of radiation, but also to clean the body from the "accumulated entropy as well."[148] Man's fish, suarian and arboreal, ancestry left in his organism contradictory vestiges of ancient physiological structures, each of which had its own peculiarity of forming entropic remnants of their activity.[149] These body structures bred aging and sickness. The structures were finally cleaned from the body by energy, chemicals, and various rays and waves. The hereditary enigma was difficult to unravel, but the work of biologists, physicists, paleontologists, and mathematicians over thousands of years finally brought forth answers and results. Man regenerated himself.

By the Era of the Great Ring new types of Man had appeared: the "Neandrathaloid" with his massive bones, great strength, and rough construction; and the "Cromanoloid" with a thinner skeleton, greater height, more delicate psychological makeup, and more sensitive feelings.[150] Geneticists combined the best from each, giving way to a more universal Man with a higher energy potential and with character traits which are different from the people of the preceding eras.

Further progress in medicine finally led to a third level of physico-phychical power, and Man gradually began to develop the ability to read others' minds.[151] Life is prolonged to 170 years, and reaching the age of 300 is a visualized possibility.[152]

Efremov described a detailed technological utopia. He projected today's technological achievements to their logical end and there he organized them in an interdependent structure which affects Man in certain ways. It can be concluded, therefore, that Efremov built a prototype technological utopia for science fiction.

CHAPTER IV

FROM PROLETARIAT TO "SCIENTIST"

1. The Great Ring Man

Efremov in his science fiction tries not only to describe the paths that lead to the development of future Communist society but he also creates images of the future Man in that society. The complexities in the portrayal of this Man are self-evident.[1] Efremov notes that true authenticity and perspectivity in the portrayal of Man can be achieved not through oversimplified interpretations of the psycho-social complexities as it is evident in the adventure stories of the early science fiction,[2] nor by projecting contemporary characters of this imperfect world into a future perfect world. To simply transpose passions, motives, and shortcomings[3] of contemporary people into a future milieu does not require efforts or skill on the part of a phantast-writer.[4] It is evident that it is much more difficult to portray characters with traits of man in the far future than it is to portray everyday characters.[5] Efremov sees that Man of the future will differ from man of today in many ways.

> The subject of literature was always man. Consequently, the phantast-writer has an obligation to say primarily something new something of his own about Man of the future. If he can not say anything new then we have no literature.[6]

The true writer, Efremov emphasizes, must grow in the awareness and understand the complex organization and the workings of the human mind--its emotions and reverberation of feelings. The writer must try to be attentive primarily to the "emotional essence of man and the environmental world.[7] This means that the emotional aspects are not separable from science and psychology. The character is unfathomable without this knowledge.[8] Given the choice of man or science as the subject of a story, Efremov would choose "without reservation--man."[9] Science is primarily an abstraction and if a literary story should depict only the actions of intelligent machines this literature will, therefore, be abstract and "cannot be considered as literature."[10] Efremov sees literature as being the medium which is always everywhere and in all genres acknowledges only "live, realistic images of man."[11] In science fiction the people of the future are a product of a completely different society and, therefore, must have different attitudes and behavior. "Their sorrows are not our sorrows, their happiness is not our happiness. Consequently, they can show themselves as being somewhat unintelligible unusual and even unnatural."[12] Being, first of all, people of far future, Efremov's heroes must be

more highly developed than people living today since they had passed through centuries and milleniums of an evolving Communist society. They are also different from our characters in their perfection in everything.[13] The future heroes are developed and trained by the inherent qualities of the Communist system and its definite scale of values. The interplay of these values in time leads Man to human perfection.

Man has the ability to organize his future since he can realize that history repeats itself and that its mistakes can be corrected. "All prejudices are stereotyped . . . thoughts, broods, dreams, ideas, the images accumulate in culture and invisibly exist with us acting for thousands of years on rows of generations."[14] To take short cuts by changing Man into Superman is not a serious proposition as Efremov sees it. The physical, psychological and social complexities are enormous. The only way Man can be changed artificially is by making him overcome several natural and social "laws." The Law of the Ariman Arrow is one of such laws. It is the tendency of a badly organized society with a morally heavy noosphere to multiply evil and sorrow. Every action, even though externally humane becomes a disaster for people, groups and humanity in general. An idea proclaiming a good has a tendency upon its application in such a society to carry with it evil. Faj Rodis (<u>The Hour of the Bull</u>) exemplifies this when she says that "A society of a lower

capitalist system cannot go by without the lie," it creates its own demons distorting reality.[15]

The Communist Man overcame the "Arrow" by carefully balancing his perception and foresight of the deeds and controls which guarantee him not to slip back into a blind game. This ability in Man was developed only by a program of training, selection, and the preservation and development of the "defense systems."[16]

Any social structure which changes to a higher "Communist" structure will encounter, according to Efremov, the "Law of Unbeneficial Coincidences." This "law" specifies that the processes of nature and societies have a tendency to wallow in failures, mistakes, and destruction.[17] This law is really a part of a much more general law of selectivity--"The narrower the corridor to perfection [through which one has to pass] is, the more this law is active."[18]

Efremov develops these laws to show the difficulties people will encounter on the road towards a Communist society. The people that will finally succeed in building this Communist world will be different in character than those that began the task. This process will mold, train, educate, and completely reshape the new Man's attitudes, beliefs, and his total behavior.

Since the EDW (Era of the Disunited World) and the advance of ECL (Era of Common Labor) human races began

to intermingle and blend with one another. This resulted in the appearance of the most varied physical types. There were varied shades of hair, eyes, skin, color, and body structures under the unions of the kxmero-evenko-indian, spanish-ruso-japanese, anglo-polenesian-zuluso-norwegians, basque-italo-arabo-indonesians.[19]

These infinite combinations gave long lines in geneologies. The genetic combinations also gave a width of choice in genetic combinations which guaranteed a complete regeneration of mankind. At the time of the EGR (Era of the Great Ring) these multi-differentiated types began to narrow down to two main types of better and complete quality of human beings--the Neandrathologids and the Cromanoloids. The former is stronger, has massive bones and a rough body construction, while the latter has a thinner skeleton, taller, and more delicate in psychology and more sensitive in feelings.[20] The geneticists took the best from each and united them in one. This work was done during the Era of the Great Ring. The characters in the novel The Andromed Nebula are citizens of the Communist society at the beginning of the Era of the Great Ring, when the multiple racial distinctions were still prominent in each individual. Efremov uses these distinctive characteristics to emphasize the basic character distinctions of the people during this Era. Each race has given its best racial qualities to the general genetic

pool of mankind. Efremov uses these particular racial distinctive characteristics to underline the physio-psychological distinctions of each character in the novel.

Efremov depicts the typical racial traits in his human characters by the paintings of an artist. He introduces in the novel The Andromeda Nebula to reconstruct the ideal racial types of the past. Art during the Era of the Great Ring reached a level of perfection by correcting its mistakes and understanding "its duty before mankind."[21] It ceases to create the oppressive monumental forms to depict brilliance and greatness, art is only an external expression of these qualities. The duty of art was to show the development of the emotional side of Man; "only art has the power to tune the human psyche to prepare it for the acquisition of the most complicated impressions. Who does not understand the magical ease of understanding, acquired by a preliminary tuning of music, color, and form?"[22] The artist-painter feels that art is the reflection of the "struggle and anxiety" of the world in the feelings of people. Art is sometimes an illustration of life but only under the control of general expediency. This expediency is beauty without which the artist-painter would not see happiness and meaning in life. Art would otherwise easily express itself in capricious invention particularly when there is not enough knowledge of life and of history.[23] Beauty

in general was subject to millenia of the unconscious acceptance of "structural expediency of forms best adapted to one activity or another."[24] Since Man developed a many-sided perception and greater activity due to his complex social life, his comprehension of beauty lay not only in the physical sphere but also on Man's "universality, augmented and refined by intellectual and spiritual activity."[25] Art, therefore, possesses a practical capability for overcoming and changing not only the external world but also, more importantly, the inner world of the emotions of Man.[26]

Kart San as a utopian artist-painter gathers and unites the "clean seeds of the beautiful authenticity of feelings, forms, color, that are dispersed throughout the various peoples into one image."[27] He restores the ancient images reconstructing the different racial types in their highest expression of beauty. In this case the selected separate elements of every race would make up the general characteristics of humanity during the Era of the Great Ring.

Kart San paints primarily the human body, taking the beauty of the body as the best expression of a race which achieved its perfection through "health and clean life."[28] Every race developed its peculiar characteristics and its own beauty under the conditions of primeval existence.

Among the first people who contributed their best racial characteristics to humanity were, Kart San believed, the ancient dark race form, the south seas.[29] His painting "The Daughter of Gondvana" depicted these people. The "Daughter" showed the complete union of Man with nature "the subconscious knowledge of the union of things and phenomena transpierced still at that time by instincts, complexes, feelings, and sensations.[30]

> The painting is simple; before the plain hills in the steppes, rays of the blinding sun, and on the edge of the terrible tropical forest, a dark skinned young girl appeared walking. Half of her face appeared to be hard as if made of a metallic body shining in the light while the other half seemed to be in a transparent but deep half-shadow. She had white animal-like teeth surrounding her high neck. She had short hair tied on the head which was covered by a wreath of "fire" (red flowers). With her right half lifted above her head she brushes aside from her path the last branch of a tree, while with her left hand she pushes away from her knee a stem covered with needles. In this static motion of the body in the free breath in the strong rise of the hand--the unconcern of a youthful life, she blended with nature as one, always changing like the torrent.[31]

Čara Nandi, a character in The Andromeda Nebula, represents perfectly the qualities of the painted "Daughter of Gondvana." When Čara dances she has a certain duality in all her gestures which are at the same time delicate and rapturous. The gestures are delicate because of the flowing movements and incredible agility of the body, and rapturous because of the sharp changes, turns, and stops which occur with an almost ellusive speed of a rapturous animal.[32]

Kart San's second painting is another daughter "The Daughter of Tetis--of the Mediterranean Sea." This Daughter is a prototype taken directly from the myths of ancient Greece, Crete, America, and Polenesia--myths which have their gods coming forth from the sea "Aphrodite Anadiomen--born of the foam, brought out from the sea . . . impregnated with the light of the stars which stand in the sky over the night sea."[33] The Daughter of Tetis possesses greatly developed feelings, she is infinitely diverse and fearlessly open, she blends with nature not through instincts as the "Daughter of Gondavana" but through her emotions.[34] The "Daughter of Tetis" appears with a:

> Profile hard as if it were cut from wood or stone . . . a mall straight slightly turned up nose, a slightly slanted backward forehead, a strong chin, and most important--a wide distance between the nose and ear--all the characteristic traits of the people of the ancient Mediterranean were reflected in the face of Čara. . . . From head to foot . . . there seemed to have been in her a little "too much" of everything. The skin a little too smooth, her waist too thin, her thighs too wide . . . and she held herself particularly upright making her strong bosum delete.[35]

Kart San's third painting on ideal racial types still is only a project but Kart has a clear idea of its composition. The painting is to depict the ancient woman of the Russian, Scandinavian, and English peoples with the "golden or light red hair of northern woman, with quiet and transparent eyes, slightly slow in her movements but with an intentive look on the world."[36]

Veda Kong is the prototype of this third racial type. Veda has a thin face,[37] her eyes are blue like the color of the "Earth sky," and she has winged long eyebrows.[38] At times her eyes appear to be grey under her ash-colored thick hair which she keeps tied in braids.[39] She has a thoughtful smile,[40] even shoulders, and a strong straight neck.[41] Another prototype of this third type, who is very similar in physical appearance and attitudes to Veda Kong is the young astronavigator on the starship "Tantra"--Niza Krit.

> The familiar up to the tiniest detail face of Veda Kong suddenly astonished Erg Noor by its likeness to that of Niza. Just as slim, with widely placed eyes and a high forehead, with long flighty eyebrows, with the same expression of a kind mockery at the large mouth, even the nose in each woman seemed slightly lifted, mildly rounded and elongated--as sisters would have them. Only Veda always looked straight forward and thoughtfully, while the small stubborn head of Niza Krit often lifted itself upward in her youthful gusts.[42]

Efremov's male characters are not too well developed in their external appearance. Erg Noor, in the novel <u>The Andromeda Nebula</u>, is as his name indicates, a Scandinavian-Viking ancestry. He was born and spent most of his life aboard starships going on various expeditions in deep Space. "My life on Earth was made up of short breaks between my travels between the stars . . . I was born half way to a double star MN19026 7A1, and this constituted my first violation of the law. I broke the law again because I was raised by my parents

on the starship and not in school. . . . When the expedition returned to Earth I was eighteen . . . I specialized in starship navigation."[43] Clearly Efremov draws Noor's Viking genetico-psychological ancestry to his professional motivation for interstellar navigation.

Dar Veter's geneology runs back to that of the Great Russian stock--as his name indicates (in translation "Gift Wind").[44] One of Dar Veter's professions is that of being the coordinator for the outer Sputniks and Space stations throughout the Great Ring.[45] On one occasion Dar Veter looked at the face of the memorial sculpture dedicated to the first builders of Earth's artificial satellites; he recognized in that sculpture his own physical traits: "massive shoulders . . . a hard face, large nose, wide chin, an unusually joyful bend in his lips which did not coincide with the sullen expression of steel eyes under the knitted eyebrows."[46]

In the novel The Andromeda Nebula Efremov depicts a usual interlocking romantic theme between four of the main characters of the novel--Veda Long, Dar Veter, Erg Noor, and Niza Krit. On a long interstellar voyage aboard the starship "Tantra" Niza Krit falls in love with her starship commander Erg Noor. Erg Noor also gradually finds himself slowly being drawn to Niza even though Veda Kong has been waiting for him on Earth for approximately a decade. At the same time, however, Veda Kong thought her

constant professional association had found some common understanding with Dar Veter. Efremov develops the romantic interrelation of his characters to show that genetic-psychological background of characters to show that logically bring common understanding at the expense of any other combination; there are essentially two types of people when analyzed in their temperament and intellectual constitution. Efremov understands that it is possible to distinguish between active people and thoughtful-contemplative people. Some transform the world of things, others--the world of ideas. In both cases these characteristics are rather individual qualities and do not oppose one another but rather fulfill one another.[47,48]

Some parallels obviously can be drawn between Niza Krit and Erg Noor. Both are of the third type--northern Scandinavian, Niza is a "wonderful creation of dear Earth . . . who had to disappear in the abysses of the cosmos with its darkness and monstrous cold."[49] Niza proves her Scandinavian warm blood by jumping into and swimming leisurely in the cold Antarctic sea: "The cold water accepted Niza while Veda shivered all over just imagining the feeling of taking every stroke. Niza quietly swam away passing through the waves with every strong push. Rising on a wave she began to wave to the others on the shore daringly inviting the others to follow her."[50] Erg Noor also travels through the cold

reaches of the Cosmos. Both Niza and Erg's main physical similarities are found in their dark-red hair and high forehead.[51] Both Erg Noor and Niza Krit are active heroes. He overcomes difficult circumstances, has a metallic voice which becomes more metallic under the stresses of difficult decisions,[52] he has a logical mind and an ability to take exact decisions under adverse situations,[53] he is efficient and persistent:

> The hands of the commander of the expedition moved with the speed of a piano player over the levers and buttons of the computer. His pale face with its definite traits congealed into a stone-like immobility. His high forehead stubbornly bent over the control panel appeared as if he was calling out the forces of elemental fate.[54]

Erg Noor does everything with exact movements, walks with swift steps. Veda Kong sees Erg Noor as a true hero who is insatiable in his exploits. He carries "this love in a full cup being afraid to spill a drop from it on the Earth exclusively."[55]

Niza is a true friend "to the conqueror of the cosmos and the iron stars as seen by her aspirations toward Space and dedication."[56] Understanding, dedication, and trust are complete between Niza and Erg Noor. Niza has complete trust in Erg Noor's capabilities as a starship commander--"Erg Noor will not make a mistake."[57]

Dar Veter and Veda Kong being also of the "northern" third type, however, prefer warmer climatic conditions. Dar Veter "prefers warmer seas"[58] and in contrast to Niza and Noor prefers the blue skies of the

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Earth rather than the "cold darkness and abysses of Space."[59] Both Noor and Veter are called "the messengers of heaven" since they both do work in Space; Dar Veter works in closer proximity to the Earth than Noor does--building Space platforms and coordinating satellites.

Dar Veter and Veda Kong are thoughtful-contemplative characters. Dar Veter's specializations required the qualifications of a person with "excelled capabilities, distinguished by a great memory and an encyclopedic knowledge."[60] Veda Kong is a historian (one of the most distinguished professions in the Communist society). She is also an archeologist, dancer, and performer for the interstellar and intergalactic communication and video broadcasts.

Mven Mas is perhaps one of the most important characters in the novel The Andromeda Nebula. Mven Mass tries to extend knowledge and contact with other beings in the Universe by trying to break the Time-Space coordinates in the universe. Mven Mas belongs to the genetico-psychological character of the first type.

> [Mven Mas] entered the room by making wide steps. The traits of his face and the dark-brown color of the smooth shiny skin showed his ancestry as being that of the black race. A white cape fell with heavy folds from his shoulders. Mven Mas pressed both of Dar Veter's hands in his strong thin hands. Both Heads of the outer stations--formerly and now, were very tall. Veter, whose ancestors were Russian, appeared to be wider and more massive than the slender Africani.[61]

Mven Mas has a rich background in experience and education, and holds numerous responsible positions in the Communist world. He is primarily a mathematician-physicist. And in spite of his intellectual capability Efremov also underlines Mven Mas's racial emotional aspect. During an unexpected telecast from deep Space monitored on Earth, Mven Mas was shaken by the message, the content left his great mind for the first time "with something new in his soul."

> With uneasiness Mven Mas felt that some kind of an abyss opened in him which during all of his life he did not suspect existed. So unbearable was this thirst to meet with the planet of the star Epsilon Tukan--that world which appeared as if by the will of the best stories of mankind on Earth. He could not forget the red-skinned young woman--her stretching calling arms and her tender half-opened lips![62]

The broadcast originated from a distant planet 290 light years from Earth. Mven Mas was aware that Earth's technology was insufficiently developed to bridge the enormous distance. Mven Mas developed a precarious psychological condition, his emotions began to oscilate uncontrolably between his realization of the impossibility of bridging the distance and his necessity to reach that planet. Mven Mas set himself the task to solve the problem at any cost. He dangerously began to experiment with the control of gravity, anti-gravity, and zero-space. The experiment was illegal because the Councils were ignorant of its existence. Mven Mas had purposefully not informed the

Councils because he knew that the experiment would not have been approved.

Mven Mas failed in his experiment. He destroyed completely the Tibet Observatory, made the fifty-seventh satellite to vanish into zero-space, and would have killed his youthful assistant Ren Boz had it not been for the advanced medicine and surgery of the Great Ring. In view of what he had done, Mven Mas retreated to a self-imposed isolation to the Island of Oblivion where all the Communist social outcasts led their own free pre-utopian life styles. At the end of the novel, however, Mven Mas is back in the world and is writing a book on the problem of intellect and emotions.

Ren Boz, Mven Mas' assistant (Efremov does not develop Ren Boz's personality beyond those of an assistant to Mven Mas) is another example of a character whose great mind is in conflict with his emotions. Ren Boz, a shy mathematician and physicist, is a person with a bold and powerful mind, capable of performing great feats in mathematics unequaled during the Era of the Great Ring. In contrast his emotional self appeared dormant.[63]

Efremov's use of the genetico-psychological method in developing human characters for the Era of the Great Ring is to show that Man of this era is finally able to develop all his inherent talents and hence fulfill his creative desires.[64] At the same time, however, the genetico-psychological human characteristics also are

too deterministic for the development of the individual character. Muko Ezgoro, for example, is a descendant of a Japanese tribe which in the past has survived by diving for pearls and algae for food. The physical qualities which permitted these Japanese to stay submerged in water for prolonged intervals of time naturally is reflected in the body and psychology of Muka Ezgoro--she is attracted to the beauty of the sea floor and feels free to dive twenty-five meter cliffs into the sea as part of her daily routine and daily exercises.[65] The reader knows little else about her.

2. The Met Hands Man

In The Hour of the Bull, Man during EMH (The Era of the Met Hands) has been biologically and psychically perfected to greater extents than any other man in history. New medicine not only perfected the body and the mind through long, arduous processes of meticulous selective syntheses of the best qualities that man possessed throughout history, but it also perfected and developed new qualities. This was made possible by the method of artificial genetic selectivity resulting "towards the Era of the Met Hands in a purity in appearance of the people which became even better expressed . . . (as for example) by comparing the ascetic toughness of the seemingly stone face of Faj Rodis with that soft appearance of Veda Kong."[66]

The "Met Hands Man" is free from the genetic-psychological determinations which characterized the "Great Ring Man." Racial perfections were all synthesized into individual whole human beings, thus taking another forward step in the energetics and universality of Man "who now consciously developed in society by avoiding the fatal results of specialization."[67]

The depiction of perfect universal characters would probably seem to approach the prototype descriptions of those proverbial mythological gods, gods who in their perfection overlook the transient imperfect world and thus become directly or indirectly satirical.

How can a writer depict utopian universal characters in a science-fiction story? What are the prototypes for such characters? Efremov believes that in a future perfect society the citizens will inevitably reflect the standards and values of that society, i.e., the environment determines Man's total behavior. This is why, Efremov writes, both the heroes and the society will appear to be "somewhat unintelligible, unusual, and even unnatural"[68] to the present reader. Efremov creates his characters from this general principle.

> Heroes live in my imagination; I perceive and feel them, even though I know that their behavior can create some perplexities for the reader. But without some kind of an approach it is impossible to accomplish the task. People of the future will certainly distinguish themselves from us. In my

> opinion, the problem of creating characters in science fiction can only be solved in this way.
>
> In this case I am speaking about the principle, the approach, the specificity. If the characters in some way appear artificial, schematic, or abstract, then it is probably because of the writer's skill or shortcomings. But the general principle is correct. It is necessary to climb this mountain in order to present a highly realistic, artistic character of Man of the far future and not to adapt, not to adjust oneself, not to transfer artificially the Man of the present into that far-away time.[69]

Efremov notes that he invariably has to create his model characters anew. He admits, however, that in order to give a much brighter and bolder quality to his characters he uses some separate traits of people he personally knows. He models the basic and general aspects of those characteristics which must make up his characters and then superimposes this foundation, so to speak, on some prototype from contemporary life who in Efremov's opinion stands closest to the required model.[70] Efremov realizes that such a model of creating characters is similar to the methods used by the romantic writers. His heroes possess many common traits. "They are always active, manly, noble; they overcome circumstances and not vice versa."[71] These romantic traits are particularly obvious in Efremov's "active" heroes. For example, with regard to love: Niza sees Erg Noor as a "legendary hero,"[72] and she sacrifices her life to save him.[73] Erg Noor sees Niza in suspended animation following an earlier accident. He asks her, "'Do you see anything, do you remember something in your sleep?' . . . asking

her in his great sorrow, feeling how his will was becoming softer than wax, how short his breath became, and how his throat contracted."[74] Although Erg Noor for the past five years has primarily seen Niza on strictly official levels, he now sees in her the embodiment of all the heroic qualities possessed only by the "ancient women" who fought counter-revolutionary forces.[75]

In general, Efremov recognizes that he is closer to the depiction of heroes who "discover lands, create technology, and find new paths out of an old world."[76] In The Hour of the Bull, he describes perfect human beings who merge with a social environment on a distant planet "Tormans." The social structure on Tormans is that of a synthesized and evolved "monopolistic State Capitalism and an 'ant heap' pseudo-socialism."[77] Some of the basic questions Efremov tries to answer are these: What is the result of the contact between the pre-communist society and the positive heroes? How does one influence the other? What are the consequences? Efremov shows that the expedition to Tormans (or Jan Jax) was successful in changing the course of that society.

Most of the novel's attention centers on Faj Rodis, the forty-year-old commander of the starship "Dark Flame." Faj Rodis is the epitome of what the Communist society has been able to create in its three thousand years of existence. She appears to be stouter

and stronger than the woman of the Era of the Great Ring. "She had outlines of a strong body with a stronger skeleton. The position of the head was on a high but thin neck. There was an adamant look in the eyes, which were placed wider apart than those of Veda, with a correspondingly broader forehead and chin."[78] Besides these outer traits of greater physical power and strength of body, Rodis also differs from Veda Kong by her inner qualities. "If anyone was able to approach Veda without hesitation but with trust, then Rodis was seemingly guarded by a trait which emphasized overcoming, thus necessitating confidence and effort. If Veda brought out in people love at first sight, Rodis brought out worship and a certain caution."[79]

Efremov chooses to portray a woman for the delicate assignment because he believes that women "by nature, are more exact, more participating, softer, and closer to nature than men." He could not avoid considering the "emotionality of a woman, her charm and beauty . . . and that by her nature a woman is more pitiful."[80] In depicting physical perfection and beauty, Efremov concentrates primarily on the feminine body since the beautiful is always "more complete in the woman, it is marked stronger in accordance with the laws of physiology."[81] Faj Rodis has a "hard genuine face of the mature woman of the EMH, an ideally fashioned structure of a strong skeleton that

shows through from under expressive muscles and a faultless skin."[82] She has clear green eyes and black hair.[83] But she considers herself the most average beauty by Earth standards.[84] On Tormans, a painter-sculptor evaluates Faj Rodis's beauty as being different from that found on Tormans, not only facially but in bearing and in body. "In no case is [Faj's body] light, but it does not appear to be heavy. With strength and massivity, [her] body is very agile and moving."[85] Another opinion about Faj's beauty comes from the wife of one of the government members, of the Council of the Four.

> You Earthlings are either immeasurably naive or very cunning. Can you not understand that you are more beautiful than any woman on my planet? Beautiful, unusual, and dangerous for our men. Even just looking at you . . . how can I explain to you? You are used to the perfection of the body; it has become a norm for you, but for us it is an all too infrequent gift.[86]

Efremov uses as Tormansian opinions those that might be expressed by citizens of a pre-communist society.

In The Andromeda Nebula, Kart San portrays ideal types of human races of the past, but in The Hour of the Bull Efremov uses descriptions of people on Earth seen through the medium of a hologram. Aboard the starship "Dark Flame" Grift Rift presents the reader with a hologram of his beloved, who was killed during a scientific experiment. She was:

> A young woman in a wide white dress sitting with folded naked arms on her knees. She slightly lifted her face, which was crescent formed in her carefully

> combed light hair. Her prominent straight forehead, thin slanted eyebrows on joyful playful eyes that harmonized with the visible traits of her full large mouth. A long neck grasped by several rows of pink diamonds descending on a low open, according to recent fashion, breast. Light youthful happiness came from her complete figure.[87]

Efremov further describes the inspiration that this holograph of the young woman gives the astronavigators.

> In the ship's cabin, there seemed to have appeared a fairy of Spring of the undying stories of mankind, who gave the astronauts that particular presentiment of a realized happiness, peculiar only for the very young during the full swing of spring permeated with all aromas with patches of sunlight and fresh Earth air.[88]

The Torman's engineer Tael' at the court is a revolutionary who falls in love with Faj Rodis. After being initially stunned by her beauty, he sees her as the

> . . . metallic Rodis who, crowned with a provocative black turban from under which shone her unusual green eyes, appeared to him as a powerful creature of an unseen world. She stood independently and freely (unthinkable for women of Jan-Jax), fully open and, at the same time, so far away and unapproachable that the engineer felt badly and felt despair.[89]

The romantic touch is quite evident in these quoted descriptions. The passages "crowned with a provocative black turban" describes Faj Rodis in an Indian sari. The women from Earth were born actresses; they like to play different roles depending on the image they want to represent and the clothes they wear. The game is called "transformation." While traveling on the starship, Olla Dez transforms herself into a marquise of the end of the Feudal era, Neja Xolli into a prank girl of the Era of

the Disunited World, and Tivisa Xenoko into a geisha of ancient Japan.[90]

Efremov relates that the feminine body movements, particularly when the women danced, had a hypnotic quality. The rhythmic movements acted on the subconscious minds of men. Being a historian Faj Rodis was able to choose all the hypnotical qualities which prevailed in many of the ancient dances on Earth, and by combining these qualities in a correctly calculated manner she became irresistable. She describes her research in the field, noting that the rapid repetitative turning was considered by the ancients just as magical as military marching and the simultaneous gymnastics of the Ionians:

> The Tantric "red orgies" in the Buddist monastaries; mysteries in the name of gods of love and fertility in the temples of Ellaid Finikin and Rome; the belly dancers of Egypt and Northern Africa; the charm dances of India, Indonesia and Polynesia--all had not so much an erotic as a hypnotic influence on man. It was only much later that psychology found, by coordinating visual associations, what feelings led to the sensations of beauty that welded efficiently with the erotic. . . .[91]

The agility and musicality of the feminine body was usually compared to the dance of the snake. On one occasion, during a performance by some Earth women dancing for a private audience composed of the "Council of the Four," the four ruling members watched briefly the sophisticated performance and then fell under its hypnotic influence. "They bent forward and fell out of their airchairs to the floor, where upon they instantly

rose and returned to their original sitting positions making it appear as if nothing unusual had happened."[92]

Faj Rodis and other members of the expedition used their knowledge of hypnosis in a variety of ways: to avoid detection and needless detainment by the Tormansian guards,[93] to relieve pain in numerous patients at a local hospital,[94] to locate damaged internal tissue in the bodies of Earthlings and Tormansians. On the other hand, Faj Rodis did not succumb to hypnotic attempts initiated by the Tormansians.

> To be hypnotized it is first necessary to break the subconscious. You [Faj Rodis] have an accumulated and trained will and a powerful mind. You subject people not only by the influence of glory and power but also by circumstances."[95]

A strong <u>will power</u> characterized all members of the Earth expedition to the Tormansian planet. This Earthling will power is evident in many spheres of activity--from keeping themselves alive under adverse physical conditions to precipitating their own death to avoid torturous pain. While strolling through the ugly streets of the Tormans' capital city, Čedi is suddenly attacked:

> A terrible blow to the head with something heavy and metallic broke the skin on the back of her head, tearing the muscle and the right shoulder joint with the collar-bone on the left side. The heavy shock contracted her throat and her heart darkening her eyes and shutting off her consciousness. . . . With the strength of her will power, Čedi lifted up her head and jerked slightly, trying to raise herself on her knees."[96]

Čedi's facial expression did not have the look of a sacrificial lamb, nor did fear or hate appear on her face; there was only surprise and pity for her assailant. This reaction by Čedi brought a dramatic turn in the assailant's emotions. When he noticed Čedi's "unusual psychological strength, something awoke in his dark soul."[97] Not knowing what to do, the assailant took a needle and pierced his own heart, falling to the ground dead beside Čedi. By contrasting the reaction of each individual, Efremov wants to describe the basic dramatic difference which exists in the psychological makeup of the two characters and their social systems.

Another example of the extent to which strong will is developed among Earthlings is apparent after the engineer Tael' has expressed his deep love for Faj Rodis. Rodis philosophically discusses this matter with him and directs his energies towards social activity, feeling it better to leave him with the gift of self-destruction, which is achieved through will power "using only the inner power of the organism." Faj notes that the wizards of India understood that making man lord of his own death freed him from the fear before life.[98] Of course, on Earth fear did not exist, for the highest step of fearlessness was achieved through self-control combined with complete knowledge and complete care of one's own actions.[99]

The swift momentum gained in all the achievements of Man during the Era of the Met Hands continued to give Man the means to control his life and destiny. Social equality of the sexes had been achieved a long time ago, e.g., Faj Rodis is a commander aboard an intergalactic Space ship. The whole Communist society is envisaged as a large family which extends its arms beyond the borders of our Galaxy. Love exists independently and self-sufficiently. Child bearing is an achievement which is crowned by happiness, trust, and pride, since to give birth to a child is not only an act which brought individual happiness but one which also meant presenting society with the very gift of life.[100] With these social attitudes and perfections achieved on all levels of life, how did human beings distinguish themselves from one another as individuals? What are the points of relation and communication between the perfect beings?

In The Hour of the Bull Efremov shows that the distinctions between individuals is made on the basis of age, maturity, and experience. The principle which underlines general character is that everyone is a scientist in the new universal sense. Each individual applies all his capabilities and knowledge, wisdom, and experience to ends which would harmonize all and everything into one coherent free family. Faj Rodis studies history of the societies of the pre-communist era. She

is a knowledgeable and mature woman who can and does enlarge the knowledge and experience of those less experienced and educated than herself--for example, Čedi. "Through the experience of Faj Rodis, Čedi seemed to enter with her soul the atmosphere of the senseless cruelty and evil of the long past centuries."[101] This was a course in history and sociology. For Čedi, Faj Rodis was a living personification of all "which Čedi aspired to be."[102] Faj Rodis also had an ideal, "The organizer of the famous excavations, artist and singer Veda Kong,"[103] who lived during the Era of the Great Ring.

Efremov presents Čedi as a youthful character who has all the feelings and emotions of a younger, less experienced girl. She is studying sociology and has at one time in her life, questioned the validity of the Community structure of the society.

> The young investigator of Man and society felt ashamed remembering how on the far away Earth she more than once questioned the necessity for the complicated control systems in the Communist society. People on the Earth, from generation to generation, spent enormous material means and strength on establishing these control systems . . . man with deformed psychology, even if unsuspectingly and wanting to do good, is capable of achieving the opposite.[104]

Efremov uses dialogues between people of different ages and experience to elaborate many of his philosophical theses, as well as to give a penetrating account of the organization of the Communist world he has created.

Many of Efremov's attempts to present such dialogues are quite successful if one takes into consideration that long descriptive and explanatory material is predominant in utopian novels. One of the more successful dialogues in The Hour of the Bull is held between Čedi and Grif Rift at a moment just before the starship enters the zero-space area.

> "It is necessary for the sociologist to glance at the roots of the universe, which is unmerciful and fatal to life, by flying through in its black depths as a seagull in a night hurricane." [said Grif Rift]
>
> "But still flying!"
>
> "Yes, here lies the greatest mystery of life and its meaningless. Matter, engendering in itself strengths for its own solution, accumulates information about itself. That is, a snake which has grasped its own tail. . . ."
>
> . . . . . .
>
> "But the world is built in such a way that the 'never' repeats itself at every instant of life. Perhaps this is the only inevitable repetition. Maybe in actuality Man is only he who has found in himself the strength to combine the deep feeling and this merciless 'never.' Earlier and even now, many have tried to resolve this contradiction through the struggle with feeling. If ahead of you 'never' exists, if love, friendship are only a process, having an inevitable end, then vows of love 'forever,' friendship 'for always'--to which our ancestors clung so much--are naive and unreal. Consequently, the more there is coldness in [human] relation, the better it is--this corresponds to the true structure of the world."
>
> "Can you not see how much this does not correspond to Man? He is, in his very essence, he is built as a protest against the 'never,'" answered Grif Rift.
>
> "I was not thinking about this," admitted Čedi.
>
> "Then accept the struggle of emotions against the instantaneousness of life and the unmerciful infinity of the universe as the natural, as one of the coordinates of Man. But if Man has combined in himself the depth of feelings and the 'never,' do not be surprised for his sadness."[105]

The above dialogue between Čedi and Grif Rift began with the analysis and description of the preliminary stages of preparation required for a Starship to enter zero-space. Efremov gradually superimposes on this material a detailed philosophical discussion about the "never" or the philosophical "nothingness" in Man (Sartre's Existentialism?). Furthermore, Efremov parallels scientific theoretical concepts of "flying in its black depth" with the concepts from everyday experience by Man on Earth "as a seagull in a night hurricane." Therefore, in one short dialogue Efremov combines four parallel themes: scientific--zero-space, philosophical--"nothingness" in Man, esthetics--seagulls, and, of course, the character dialogue itself between Čedi and Rift. This is one of the successful esthetic devices in Efremov's science fiction, raising thus the artistic quality of the science fiction narrative.

There are, however, a good number of dialogues that are less successful. These dialogues, at best, turn into dogmatic and ideological charades of the worst kind. One example of such a dialogue is held between Veda Kong and Niza Krit.

> "It appears to me that the best present that a woman can give to her beloved is to recreate him again and in this way to prolong his existence. This is surely almost immortality!" [Niza said]
> "Men judge differently in relation to us," answered Veda. "Dar Veter told me that he would not want a daughter too similar to his beloved. He finds the idea to leave the world and leave her without

> himself, without the shelter of his love and kindness for the unknown fate . . . This is the vestige of jealousy and protection."
>
> "But I cannot support the idea about the separation with the small one, my dear creation" continued Niza with her absorbed attention in thoughts. "Give him away for training, half nourished!"
>
> "I understand, but I disagree" Veda frowned as if the young girl had touched a bad string in her soul. "One of the greatest duties of mankind is to conquer one's blind mother instinct. Understanding, that only the collective training of children by specially trained and selected people can create the Man of our society. Now, this thoughtless, ancient, mother's love hardly exists. Every mother knows, that the whole world is kind to her child. Here the instinctive love of the wolverine has disappeared. It existed only because of the animal fear for its little ones."
>
> "I somehow understand this," said Niza, "but somehow only with the mind."[106]

Furthermore, Veda hastens to suggest that for such "instinctive mothers there is an Island for Mothers--Java."[107] The characters in this dialogue do not blend as they should. Veda is supposed to have the attitude of a more mature understanding woman. Is her maturity emphasized only by her ideological stand? Living in the same society, Niza would at least have known the basic social structure and did not need the elementary lesson. Further in the dialogue, Veda seems to belittle Niza's youthful attitudes. This is, on Efremov's part, an artificial and unsuccessful method for outlining Veda's wisdom--her overall grasp of reality. This approach is made even more incredible when Niza, after all this, affectionately "snuggled up to Veda."[108] On the whole, this dialogue does not seem to represent a natural flow in communication between two people of a sophisticated society. Efremov

might justify the use of these inconsistencies in the dialogue of his characters by his essential principles--to try to saturate the novel with "scientific concepts and terms,"[109] and to add color to the dialogues and actions of his future people, or to "reveal possibilities for collisions between the communist social awareness and the . . . harmful ideologies."[110] But these inconsistencies seem to do more harm than good in depicting the psychological content of his heroes.

The mother-daughter relationships between women of the Era of the Met Hands as well as of the Era of the Great Ring, are another way in which Efremov shows the relation between people in a perfect society. Unfortunately, Efremov does not present enough material in his novels to reveal the father-son relationships between the males of the society. They relate along professional lines, e.g., Mven Mas, Ren Boz, and Dar Veter (The Andromeda Nebula) but it must be assumed that father-son relationships also exist.

After Faj Rodis has patiently explained to Čedi a problem in sociology, Čedi shows her gratitude by clinging "to Faj Rodis as a daughter seeking support of a mother."[111] Faj Rodis's hands possess certain "calming powers" of which Taël' is well aware.[112] On the other hand, Čedi in turn is a mother-like figure to a Tormansian woman:

> Čedi embraced Časor in a mother fashion, kindly glancing over her hair and cheeks. The Tormansian woman quivered, snuggling up to Čedi and Čedi whispered several kind words in the Earth language to her. The girl hid her hot forehead on Čedi's breast, as with a mother, even though the difference in their age was insignificant.[113]

The rule is that the less spiritually mature and perfect people will find human spiritual comfort and understanding from those who possess more of the same qualities. Efremov develops this rule to universal proportions just as he does his views on beauty and human forms.

This rule of spiritual dependence and fulfillment is further developed to depict the qualities of the positive character who lives in a pre-communist society. Such positive characters survive degradation and exploitation and keep their dignity and integrity. The characters are the "salt of the planet." These qualities are the basic minimum requirement of any human being who hopes to develop a utopian society; in other words, he is the forerunner, the prototype of the Communist society.

Čedi meets and shares an apartment with a local roommate, Časor, in a Tormansian city. Časor has not lost her attitude of innocence her child-like view and hope for a better world. She is aware of the social and psychological hopelessness,[114] but she does not succumb to it. Efremov endows such character with a love for the arts. "Časor began to sing, and Čedi was surprised by the musical clarity and sadness of her singing, so

unlike what she heard on the streets or in the places of entertainment. . . ."[115]

Vir Norin also meets a young woman of twenty,[116] Sju-Te, who possesses the same characteristics as Časor. After an incident in a bus which brings embarassment and degradation to Sju-Te at the hands of a malicious young man, Sju-Te does not let this incident degrade her. After getting off the bus with Vir Norin, she sang to him ancient songs and battle hymns of long ago which were also quite different from the tearing melodies of the popular songs in the capital city. Sometimes Sju-Te stopped to illustrate the melody by dancing steps.[117]

On Earth, sex is viewed and applied in conformity with the general philosophy of life. The will power in each person does not bring one's sexual feelings to waste, it rather brings them to the heights of passion.[118] Efremov depicts a new distinction between lust, physical passions, and love. On Tormans the population has only one word for love--its physical union--and ten words which are considered as swearing.[119] But on Earth there are five hundred words describing human beauty.[120]

The Communist citizens during the Era of the Met Hands does not only excel in will, reason, and calculation, he is sensitive to art and music and also has well-developed feelings. These feelings are directed and related to his environment, society, and people, and

they are part of the whole Communist way of life. Dari Ram having finished his work at the control panel in the Starship, could find nothing better to do than to think about life on Earth:

> Far, far away, at a distance of seventy-eight light years, life on Earth continued on, a beautiful life constructed by Man to provide happiness and inspired creative labor. In the classless society, everyone knew his whole planet thoroughly: not just its factories, mines, plantations, and marine industries, its research centers, museums, and forest preserves, but also the quiet corners where one could find peace and solitude or be alone with one's dear people.[121]

Mven Mas has some turns of conscience after he fails at his illegal scientific experiment with anti-gravity.

> Mven Mas, suddenly sorrowful wondered if he did not belong to the category of "bulls"--people who always caused troubles to mankind. A "bull" is strong and energetic but completely insensitive to others' suffering and sorrow, thinking only to satisfy one's own needs. Suffering, discords and unhappiness in the distant past of mankind were always precisely aggravated by such people of various convictions proclaiming themselves to be the only ones who knew truth. . . .[122]

After having spent too long on the foreign planet Tormans, Faj Rodis begins to feel nostalgia for her home planet. She sees a small forest not far from the gardens of Čoam. This little forest resembles very much the one she knew on Earth near her school of the first cycle. She remembers now sometimes, when studies and training were so difficult, the young Faj used to run to the shade of a grove to cry. "And now finding herself outside the court, . . . Rodis threw herself toward the tree and clung to the trunk, trying to catch the native smell of the

tar and bark warmed by the sun. . . ."[123] Faj Rodis also liked some ancient Russian poets. "She liked most of all Russian poetry of those times, for its cleanness and honesty towards Man."[124]

Vir Norin is sensitive to other people's sorrows. The more he observes a young woman who cries by herself, the more he feels "the depth of her soul."[125] He understands that she is on the edge of a great catastrophy. Faj Rodis can feel danger which she does not see.[126] The majority of people on Earth during the Era of the Met Hands possess the power to predict events.

> Some time back people did not understand the feeling of the interconnection of events and the possibility to look into the future. Neither presented anything supernatural or generally similar to mathematical calculations. . . . Now psychic training permitted every one to have the power of this "gift." It depended of course on the level of one's abilities. . . .[127]

During a difficult and critical time, Tivisa feels more and more that their death is approaching. They are surrounded by wild people.

> Trying to put off the knowledge of the inevitable, Trivisa sat at the head of the quiet sleeping Tora and sadly looked into the infinitely dear, wise, and at the same time childlike naive face. The knowledge of the inescapability approached closer and closer, and with it grew softness and a horrifying feeling of guilt as if she was responsible for not being able to defend her beloved.[128]

During this dangerous situation, the archeologists could easily escape. They have the technology and the means, but in the process they would have to destroy their

opponents--and Earth people "could not even conceive of the idea of killing."[129] This meant self-sacrifice instead.

> A cruel sadness of the last minutes passed Tivisa, when her glance forged itself on the stature of the young girl in a coverlet. The unfearful face, the proud line of the body, the despairing joining of the hands--all the tragic strength of sorrow about the past and the stubborn belief in the beauty of the future, the contradictory union of which Man is formed.[130]

Faj Rodis also ended her life by self-destruction, under similar circumstances and for the same ideals, to give hope of a better life and world.

The shortcomings of Efremov's character portrayal, its method and metaphysics, will be discussed in the following chapter.

CHAPTER V

FORECASTING, MODELS, AND FICTION

Considered as a whole, Efremov's science fiction is an ambitious undertaking which can be analyzed and evaluated in terms of criteria found in the following representative section of his own article "Milljardy granej buduščego" in Komsomol'skaja pravda, January 28, 1966, col. 1.

> The future will be built from the present, not mechanically built but dialetically continued into the future. The notion of a strictly determined structure of the future as seen by many writers is, therefore, sheer metaphysics, a repeated clumsy attempt at the biblical prophesies. Only the dialectical extrapolation of the real experience of history of the Earth, cosmos, and human societies can claim the scientific foresight of the possible future.
>
> It is evident that science fiction is not and cannot be a prophetic foresight of an integral picture of the future. In his attempts to see the future world, the science fiction writer finds it necessary to limit himself by subjecting his work to some one line, idea, or image. Then after choosing from the present--from the reality surrounding his life--those phenomena which appear to herald the future, he extends those into his invented world by developing them according to scientific laws (dialectical materialism).
>
> If the work is constructed in such a way, science fiction is then scientific. If the main interest in the work is solely scientific discoveries, then science fiction becomes narrow, technical, and limited in scope. If man is the central theme, then the work can become involved and profound.

The first part of the quotation distinguishes between methods of forecasting conditions and systems. The second part discusses a method of choosing and organizing material for the future conditions. The third part defines the content of science fiction. Let us examine these issues in the order given by Efremov.

1. Forecasting

Efremov distinguishes two possible methods for forecasting the future. One is mechanical, which is to say deterministic and metaphysical, and the other is dialectical or "scientific." Efremov's analysis raises the following questions: Are forecasting methods only mechanical or dialectical? Can forecasting be "scientific?" What is the nature of the "dialectical" forecasting?

In philosophy of natural science, prediction is but a means which can strengthen confidence in an expounded theory, a theory that has already given a systematically unified explanation.[1] An example of this can be seen in Newton's theories on the law of gravitation and the laws of motion which determine the gravitational forces that physical bodies exert on each other relative to their mass and distance and the relative changes that occur due to their mass and distance and the relative changes that occur due to their velocities and location. These uniformities can yield predictions as well as retrodictions. Halley was able to predict

the return in the year 1759 of the comet that he observed in 1682, and he retrodictively identified the appearance of the comet on six previous occasions, dating back to the year 1066. Furthermore, Newton's theory was also significant in its explanatory and predictive role in the discovery of the planets Neptune and Pluto.[2]

Of course, such predictions are not as simple to make for social and psychological systems. It is easy to recognize the formal structure for scientific prediction since that structure is basically similar to the logical structure of a scientific explanation, with the difference being in the temporal vantage point of the inquirer.[3,4] This shows that deduction and induction do not distinguish the methodology of prediction from the scientific method itself, and, thus, one can not speak of a science of prediction. The philosophy of science (analytical) has great weight, however, in justifying both the reasoning and the methods for making social prediction, thus avoiding dilettante discussions of cycles, fluctuations, unique events, extrapolations, etc.[5]

During the 1960's there occurred a world-wide professional indulgence in future analysis. There is an ever growing number of people entering into full-time futures research for industry, technology, government, and the military. This is evidenced not only by the ever increasing number of published books and articles[6] in that field but also by the increase in the number of

professionals working on advisory boards, information gathering commissions, and study groups.[7] The three main reasons for setting up these forecasting means are to aid in planning (cities, transportation, communications, etc.), to anticipate side-effects of change (social, ecological, legal, moral, political), and to maintain a competitive position.[8] A hundred different techniques of forecasting have been invented to cope with the most varied situations, but many are still basically pragmatic or intuitive in methodology. In this respect, the methodology relating to explanation is justifiable if explanation and prediction are methodological counterparts. In respect to the social sciences, however, this method has not been fruitful enough and has fallen under increasing attack in recent years.[9]

Nicholas Rescher distinguishes three predictive methods.[10] The first is the extrapolation of historical experience, which consists of projecting into the future current trends and tendencies. This method is in general ineffective because the rapid pace of scientific and technological change often necessitates sharp breaks with the consolidated experience of the past. The second method is the use of analytical models to devise processes relevant to the present context of a system and then to suggest their consequences in outcomes for the system's future. The problem associated with this method is that little might be known about the parameters of the

analytical models. The third method involves the systematic use of experts, who make informed judgments of data. The data may be obtained via questionnaires, interviews, sessions, Delphi techniques,[11] and operational games.

Nigel Calder[12] notes that there are basically two modes of forecasting which are nondeterministic in view. There is the explanatory mode, which involves exploring by extrapolation those possibilities that might arise from current trends and innovations, and the normative mode, which involves the construction of a desirable future and then the reconciling of current possibilities to the means available to accomplish that desirable future--whether it be a civilization, communism, Christianity, or a relatively narrower goal such as putting a man on the Moon. The normative forecasting can materialize only within the possibilities suggested by explanatory forecasting, but at the same time, the goal selected determines the extent of the possibilities for change.[13] Also, the normative forecasts can easily become politically charged and can lead to falsifications.[14]

The above evidence shows that Efremov's approach to forecasting is too simple and too one-sided. First, "scientific" prediction is but one of the steps in the scientific method by which a theory is confirmed. Second, the dialectical materialist principles of forecasting belong

to the normative mode of forecasting, hence they stand closer to Efremov's definition of the "mechanical" method rather than the "scientific" in the usual sense.

2. Material from the Present

According to Efremov, the method for choosing and organizing material for future conditions involves selection from the present according to the principles of dialectical materialism. This position is essentially related to the above discussion of forecasting but here Efremov stresses the interrelation of "Science" and value judgments. Efremov states that science, by its methodology, is limited to giving interpretations of the world and, therefore, needs a "nature philosophy" which will unite the separate specialized branches of the sciences.[15]

The worth of a prediction probably lies in its potential for serving different purposes, thus permitting alternative futures. A problem confronts the predictor and the historian when they have to interpret their respective data from the standpoint of a present situation. To the sociologist the problem might arise not because he lacks statistical data but because he does not know what he should be measuring.[16] This problem concerns the assigning of "meaning" to data or distinguishing between value-data and value-free-data.[17] From the point of view of deductive analytic logic, nothing can be added to the meaning of propositions; all that can be done is to make

explicit what is implied in the meaning. This is a basic question which concerns the "unbridgeable gulf" between what is and what ought, i.e., inferences of what "ought" to be can never be derived deductively from premises whose meanings are limited to what "is"; inferences of what "ought" to be can be derived only from statements that have an "ought" meaning at least in the major premise.[18] Efremov is correct, therefore, to assess that science primarily "disciplines reasoning and trains one in the use of logic and the economy of thought . . . "[19] and that there is an ever growing "Babylon Tower of information."[20] Efremov's solution, however, should be critically examined.

Natural philosophy is as old as philosophy itself. It concerns itself with the general characteristics of animate and inanimate nature and tries to explain natural phenomena by using principles derived from nature. The more recent method of inquiry is the inductive method. It abstracts its principles from scientific investigation and presents them systematically. The result, however, resembles a popularization of scientific results and findings. The speculative method, on the other hand, renders nature more comprehensive by introducing general principles but disregards scientific or other objective points of view, hence making the philosophy dogmatic since it clings to absolute principles (Plato). The critical method which

is the oldest, refers to general principles such as causality and being and approaches problems for the purpose of explaining them (pre-Socratic).[21] It is only toward the turn of the century that there is a shift in meaning from the Philosophy of Nature towards a more explicit designation of Philosophy of Science, which deals more specifically with logic epistemology, and the methodology of science.[22]

The procedure for forecasting, i.e., for choosing material from the present to compose a future, depends on the method used. The similar patterns in science and philosophy seem to suggest that at some time science passes through a philosophic stage in its development so that there is basic agreement on methods and assumptions for the gathering of new data. Philosophy in this respect is concerned primarily with strategy, while the empirical stages are concerned with tactics. After there is an excess amount of data, then theorizing, elaboration of general concepts, and method of development are again reintroduced. The process is carried on by symbolic modes used in thinking.[23] Perhaps the best way to analyze and evaluate this whole process is by studying models of thinking.

Karl Deutsch[24] among others, notes that there are several models. At its practical and theoretical level, the classical concept of <u>mechanism</u> as a model of thought

implies the notion that a whole is equal to the sum of its parts and, therefore, can be run forward and in reverse, fulfilling its uniquely determined function so long as the parts are assembled in a precise way. This model, however, neglects the concepts of growth, of reversible change, of evolution, of novelty and purpose. Such mechanistic conditions have never been found anywhere, and the more complicated the mechanical model becomes the less "mechanical" it is in practice. The model is significant, however, as an analytical method, with its standard unchanging elements acting according to simple unchanging laws.

A biological or organism model cannot, it is believed, be exhaustively analyzed in its essential parts without damaging it. It has a history which follows its own particular "organic law" of birth, maturity, and death; it is unidentifiable according to mechanical "causes" and unanalyzable in its changeability from one stage to another. Such imponderables appear as "vital force" or the miracle parts concepts and do not help significantly in preparing predictions or experiments.

A third group of models comes from the notion of process, which is developed from the experiences of dialogue, struggle, and historical process. They suggest a connection between conflict and communication, with changes which might be irreversible yet analyzable in

discrete elements and arranged in a specific structure. This structure might have concepts of change and law as well as a discoverable direction of the process as a whole, e.g., Christianity's concept of a directed history, Hegel's and Marx's version of dialectics. Yet, these models remain weak in their inner structure. "Logos" and "dialectics" are qualitative notions of intuitive insight and thus offer little measurable or analyzable detail. In this case, if specificity is demanded, the theorists of process often give mechanical analogies, e.g., that evolution "unfolds" or has elaborate, already existing combinative ensembles of unchanging elements and laws (in Efremov's case the "Law of the Ariman Arrow," "The Law of Unbeneficial Coincidences")--whereas evolution actually permits sudden change and genuine novelty both internally and externally. The models of process have qualitative changes which are neither measurable nor quantitatively predictable over space or time.

Efremov's model of thinking, i.e., the determining factor by which he chooses "material from the present," is based on a variant of the process system. As it can be seen, all three of the above mentioned models are essentially based on operations known before 1850. In the 1940's a new basic development took shape in communications engineering--the science of communication and control, which uses such notions as feedback, information, memory,

self-steering and automatic pattern recognition.[25] Science fiction could readily incorporate this approach as a basic standard.

3. Efremov's Science Fiction

Efremov writes, in the quoted newspaper excerpt at the beginning of this chapter, that science fiction will be "scientific" if it is constructed in accordance with the dialectical materialist principles of forecasting and of values in the choice of the material from the present for a future condition. The method is normative (mission-oriented) and is built on a variant of the process model of thought, both approaches limit the scope and mechanics of research and do not exhaust the possibilities that can be developed by science fiction.

Efremov shows in his article "Milljardy granej budušč̌ego" that he sees technological achievements merely as stepping stones to a more universal perfect post-industrial Man (compare these views with those of Teilhard de Chardin). Efremov's science fiction is not solely based on scientific discoveries, which in his view would render science fiction "narrow, technical, and limited in scope," he instead concentrates optimistically on Man and thus undertakes the hazardous road of portraying idealized utopian characters. His observation that the characters of the future are products of a completely different society and are thus different in their total perfection

(as determined by the inherent qualities of the Communist society) and hence can prove to be somewhat unintelligible to the contemporary readers[26] is in theory a principle which is basically anthropological rather than psychological. The psychology of Efremov's heroes is idealized, didactic, and declamatory. The approach is justified to a certain degree because the heroes are representatives of a utopian society, which has to be described for the contemporary reader. Generally a perfect universal character would not vary significantly in behavior and psychology from his other perfect, universal neighbor. Efremov's wish to expose man's "psychological complexity" by rejecting Freud and a branch of Behaviorism might be justified to a certain degree, but the fact that he replaces both with a psychological process based on "impulsive flashes" supported by a "philosophical purport"[27] alone seems to indicate to an oversimplification of the problem (see above section on models). It is doubtful that character conflicts among utopians can be endowed with very many variations. Some methods which Efremov uses to devise conflicts are rendered by: First, referring to the pre-utopian imperfections which still disrupt the Great Ring Man by acting on his genetic and psychological differentiations; in love, (e.g., Niza, Noor, Veda, Veter); in anger, fear, and hate, (e.g., Pur Xiss, "[The astronomer rose suddenly and waved his hands,] his distorted

face became unrecognizable, different than the face of a person of the EGR. Fear, self-pity and the thirst for revenge erased all traces of intellectuality from the face of the scientist. [Xiss swore with words which went out of use a long time ago]."[28] Second, referring to the mind-emotion conflict which may cause either impulsiveness, (e.g., Grift Rift: "I will erase their city from the planet and will make a hole a kilometer deep to save you.")[29] or motivational character change, (i.e., Mven Mass undertakes unlawful experiments with zero Space). Third, emersing the positive hero in an imperfect society, and by the end of the novel a total revolution takes place in that imperfect society (compare with A. Tolstoj's Aélita, 1922).

The number of characters on the utopian canvas in The Andromeda Nebula is small. There is a small cast (three men, three women) of principle characters and a large number (thirty-two) of secondary characters who appear on the scene just as suddenly as they disappear after they have performed their function, e.g., Muko Ezgoro, a perfect swimmer and diver who happens to be of Japanese descent, finds a solid gold statue of a horse on the ocean floor. Other to introduce her genetic-psychological characteristics, the reader knows nothing else about her. The gold she found is used, as the reader finds out at the end of the novel, to process rocket fuel.

In The Hour of the Bull the principle characters and representatives of the Era of the Met Hands are women, while the principle Tormans characters are men. There are sixteen supporting characters in all. In both novels the males' professions identify them with the utopian or dystopian "present": administrators, technicians, scientists, artists. In comparison, the women are historians, sociologists, and psychologists, thus implying an identification with the utopian "past." This contrast in professions stands out particularly in The Hour of the Bull since the EMH women not only are esthetically and emotionally attractive in comparison to the grim Tormansian males but also carry the dialogue with their profound knowledge of historical and sociological "laws." On the other hand, among the Tormansians there are no principal female characters. Information about the Tormansian past is suppressed. In view of the above contrasts, one begins to wonder if Efremov's Communist societies will not develop into a type of Matriarchy.

Efremov's anthropomorphic theory regarding extraterrestrial beings is not developed to its possible logical conclusions as science fiction would usually do. Efremov's extraterrestrial civilizations throughout the universe never reach levels of development which surpass those of the Met Hands Society, neither does Efremov suggest Man's succeeding developments: he only hints that there is a gradual emergence of the power called telepathy.

Efremov's technological utopias, as well as their citizens, are isolated in time. History in the novels is scanty, generalized, tendencious and vague. The Communist heroines either compare their Society and behavior with those of the past, or try to decipher the half forgotten past through the evidence given by archeology (The Andromeda Nebula) or of manuscripts, movies, and tapes (The Hour of the Bull, and Cor Serpentis). Only on two occasions does Efremov mention historical personalities by name: Heisenberg and Einstein. The father of dialectical materialism--Marx, is mentioned only once in The Hour of the Bull. This temporal isolation Efremov imposes on his utopias is probably intended to underline the "universality of the laws" that work on any physical, social, or psychological conditions. The dialectical materialist process is present not only on Earth but in all corners of the universe. The historical names mentioned in the novels seem to play the role of reference points for the reader, to avoid confusion when there is an enormous scientific and philosophical material. The use of temporal isolation can also be interpreted as an attempt on the part of Efremov to create a stronger contrast between pre-utopian and utopian worlds and their characters. In such a construction, the writer does not have to reconcile or trace individual events in the idealized societies to

particular antecedents in the real world. This approach is justified in science fiction writing, but it cannot be called scientific.

New technological and psychological knowledge require from the utopian genre in science fiction to become more diversified, critical, and original. Everyday concepts such as art, creativity, happiness, love, and marriage are essentially utopian conditions and goals (aspirations) which will have to be analyzed much more meticulously. At the same time, Robert Boguslaw finds parallels between contemporary researchers in control systems operations, systems designers, and data processing specialists, on the one hand, and the former utopians, on the other hand.[30]

A utopia is first a vision or dream, which then acquires concrete characteristics and a structure through the interplay of imagination (the combination and recombination of patterns previously formed) and intelligence (the ability to solve new problems or challenges correctly in order to arrive at a goal--end state).[31] The definition presupposes that there is sufficient data or material to be organized into new patterns, which in turn may be used as a basis for further patterns. Utopia is, then, a vision (V) or dream which is inversely proportional to imagination (E) and to intelligence (I). A passive utopia is what can be termed a daydream or fantasy.[32] An active

utopia can be described as a dynamic goal-seeking system. When a writer creates a social utopia, for example, the social system presupposes a minimum degree of efficiency in information flow within the social organization, as well as in the complexity of the human psyche. Otherwise the system will prove to lack imagination or intelligence or both thus resulting in something which is less than a utopia. A reduction in the complexity of the human psyche or in the social efficiency of information flow reduces the system to processes, or biological, or mechanistic models, which might result in dystopias or contra-utopias.

Efremov's approach to science fiction (centering attention on his interpretation of man and his criticism of Western anti-utopias) make him by-pass a series of typical science fiction themes which might have more readily reflected his approach. The themes involve machines and cybernetics. It is true that Efremov's Communist environment abounds with automation in all fields: there are "universal robots," planetary giant electronic brains, biotonics, etc., but Efremov brushes aside their relevance for interpreting the complexity of man. Cybernetics is only viewed in relation to computers, which are considered "idiots" as compared with man.

One usually hears that "mechanistic" analogies are only valid enough for the explanation of simple physiological responses but cannot treat matters of central

concern to human experience, such as love, hate, desire, pity, grief, experiencing of beauty, recognition of truth, etc.[33] But this is all a problem of the semantics of mechanism. The argument presupposes human complexity is too elaborate for any system to give an adequate explanation. Many people see a computer and automatically yield to the over-enthusiastic opinion of many popularizers of science that, since the present computer can perform human-like mental processes, it is then all a question of degree. Cybernetics, on the other hand, is a systematic study of communications and control in all kinds of organizations. The field of study shifts from driving to steering, from instincts to systems of decisions, including noncyclical aspects of such systems. Steering and self-steering exist in biological organisms, human minds, and societies.[34] Cybernetics deals with all forms of behavior insofar as they are regular, determinite, and reproducible. Materiality and "the holding of ordinary laws of physics are irrelevant.[35] Cybernetics gives a better practical understanding of the human complexity, and science fiction can extend any possibilities of this field. The level of achievement can reach a point where any system can be automated, for in order to facilitate efficiency any decision-making body (management) must operate in accordance with a system or program, and whatever can be programmed can also be

automated.[36] This alone should answer many science fiction questions: How far can "machines" go in developing intellect? How can machines compete with man? Can machines have individualities? How will man change in an environment of intellectual machines and in a self-modifying environment? In this view Efremov's methods in the interpretation of Man, as he hints himself, that they are "romantic," certainly does not exhaust the possibilities that science fiction can develop.

From the above evaluation one may conclude that Efremov's position shows several weaknesses:

1. He does not make a clear distinction between the scientific method and a philosophical method (dialectical materialism). His science fiction, therefore, tends to become, on the one hand, strongly charged with philosophical criticism and rationalizations causing sections of his prose to become stereotype and monotonous; on the other hand, his forecasting methods and model building may appear dated and questionable from the point of view of scientific positions.

2. The artistic aspects of Efremov's writing require, of course, a special study. In the context of the present considerations, it must be said, however, that it is difficult to embody Utopian notions in artistic forms. By making a strong effort to portray Man, Efremov is compelled to idealize him to such a degree that the

portrait becomes reduced to the level of a caricature of a social structure: at the same time, Efremov separates the Society by a distant temporal interval thus subjecting his characters to an anthropological analysis rather than a psychological one.

The above weaknesses may account for a number of deviations from Efremov's system in some of the most recent Soviet science fiction. These flaws may also account for a slight decline of Efremov's popularity in the readership since 1970.[37] The topic of the exact position of Efremov in the history of Soviet science fiction, for example, the parameter of his influence on his contemporaries and on younger writers still awaits examination, which would involve the analysis of the work of other writers. However, there are sound propositions in Efremov's theory which are not only reflected in current Soviet science fiction, but are still serving as basic tenets in the development of the genre. Thus, in his evaluation of the potential of the genre of science fiction as a valid branch of creative literature, Efremov makes the following contributions:

1. He distinguishes between works of imagination, fantasy, and fancy. If a work of art entails, as defined on page 142 in this study, a vision inversely proportional to imagination and intelligence, then science fiction would have to be based on an active balance between imagination and intelligence--though a leaning toward

imagination would probably be welcomed. It appears that "science fantasy," would then be a literature which uses scientific and technological material but it will have a weak internal structure in terms of the interdependence of subject and object. Today, more than at any other time, science fiction has within its reach a large amount of scientific and technological material which can be applied and developed in an independent literary genre. Therefore, techniques must be found to incorporate this material in a plausible and aesthetic way.

2. He sets up methods for character creation for science fiction. In spite of obvious hampering complications, Efremov has developed a number of valid principles, for example, the notion that man of a more perfect society will reflect the values of that society in his total behavior, the necessity to find new foundations for the interpretation of psychology in man, to find methods of creating new character prototypes, either by superimposing a "required" type upon an existing representative in certain best traits of his antecedents, or by projecting and elaborating traits that are genetico-psychologically determined. Such methods create an avenue for further elaboration for succeeding writers.

3. Efremov's reintroduction of the utopian novel coincides with the appearance of the concept of Utopia in such expanding fields of creativity as futurology and

systems analysis. The probing of all aspects of the utopian content will also become a natural task for the science fiction genre. It must be remembered that utopias can be oriented towards the past as well as towards the future. They can also be pessimistic as well as optimistic, but utopias oriented toward the past have often been presented under the label of "realism,"[38] while utopias oriented towards the future under that of "fantasies." In both cases the propensity for overestimating events, effects, factors, and rationale is just as flexible if not just as questionable. Perhaps in order to rectify some of the distortions or oversimplifications for which one might blame even such modern utopists as Efremov, other avenues of scientific thinking, such as cybernetics, should be explored to lend new logical rigor, systems, and psychological models for the creative literary content. Nevertheless, Efremov's insistence on fathoming the future as a whole system is a far cry from primitive depictions of Utopia.

NOTES

Introduction

[1]Computed on the rise of human population: from 3.4 billion to 7 billion by the year 2010.

[2]Alvin Toffler, Future Shock (New York: A Bantam Book, 1971), p. 27.

[3]John McHale, The Future of the Future (New York: Ballantine Books, 1971), p. 12.

[4]Ibid., p. 271.

[5]A. F. Britikov, Russkij sovetskij naučno-fantastičeskij roman (Moscow: Nauka, 1970), p. 231. (All translations are mine, unless otherwise indicated).

[6]I. Efremov, "Na puti k 'Tumannosti Andromedy,'" Voprosy literatury, No. 4 (Moscow, 1961), p. 144.

[7]Gor Genadij, "Žizn' dalekaja, žizn' blizkaja," Literaturnaja gazeta, No. 43 (Moscow, October 22, 1969).

[8]"Kakov on, čelovek buduščego? Literaturnaja gazeta (Moscow, November 12, 1969), p. 5.

[9]Gor Gennadij, Žizn' dalekaja, žizn' blizkaja," Literaturnaja gazeta, No. 43 (Moscow, October 22, 1969); A. Belousov, "Zabyvaja o social'noj obuslovlennosti," ibid.; V. Sefner, "Obydennoe v skazočnom i neobyčajnoe v budničnom," and A. Kazancev, "Luč mečty ili poemika?" Literaturnaja gazeta (Moscow, October 29, 1969); A and B Stugatskij, "Davajte dumat' o buduščem," and E. Tamarčenko, "Realizm neožidannogo," Literaturnaja gazeta, February 4, 1970; R. Nudel'man, "Mysl' učenogo, obraz xydožnika," and K. Zamoškin, "Vzgljad v buduščee," Literaturnaja gazeta, March 4, 1970; and others.

[10]For example A. F. Britikov, in his Russkij sovetskij naučno-fantastičeskij roman, pp. 249-254, criticizes Isaac Asimov's introduction to his anthology of More Soviet Science Fiction (New York: Collier Books, 1962), pp. 7-13. Kingsley Amis, New Maps of Hell (New York, 1966), and P. Anderson's article in the journal "Fantasy and Science Fiction," No. 10, 1965.

Western science fiction critics on Soviet publications and material have unfortunately restricted themselves, primarily, to the compilation of Soviet science fiction anthologies, and general historical observations of that genre. See: Robert Magidoff, ed., Russian Science Fiction, An Anthology, trans. Doris Johnson (New York: New York University Press, 1964); also Russian Science Fiction 1968, An Anthology, trans. Helen Jacobson (New York: New York University Press, 1968); also Russian Science Fiction 1969, An Anthology (New York: New York University Press, 1969). Other anthologies are: Isaac Isimov, Soviet Science Fiction (New York: Collier Books, 1962) and More Soviet Science Fiction (New York: Collier Books, 1962).

Path Into the Unknown, The Best of Soviet Science Fiction, introduction by Judith Merril (England: MacGibbon and Kee, Ltd., 1966 and Dell Publishing Co., Inc., 1968, N.Y.); Mirra Ginsburg, ed. and trans., The Ultimate Threshold, A Collection of the Finest in Soviet Science Fiction (New York: Holt, Rinehart and Winston, 1970). Significant thrust forward has been made by John P. Glad's dissertation entitled "Russian Soviet Science Fiction and Related Critical Activity" (New York: University of New York, 1970).

[11]V. D. Ivanov, "Ob avtore," Velikaje duga, G. Prusov, ed. (Moscow: 1956), p. 739.

[12]Technology, according to existing historical records, preceded, science. Technology may be defined as the inner and outer change man undergoes as he effectively uses and changes the environment through his own potentialities for his own needs (real or imagined). Science can be defined as a method for describing, creating, and understanding human experience. R. B. Lindsay, The Role of Science in Civilization (New York: Harper and Row, Publishers, 1963), pp. 197, 340; Charles R. Walker, Modern Technology and Civilization (New York: McGraw-Hill Book Co., Inc., 1962), p. 2.

[13]Vol. 3 (Moscow, 1960), p. 798.

[14]Modern English Usage (New York: Oxford University Press, Inc., 1957), p. 169.

Chapter I

[1]I. Efremov, "Milljardy granej buduščego," Komsomol'skaja pravda, January 28, 1966, p. 17.

[2]Alexander Beljaev single handedly, opened an era in Soviet science fiction. An era, which ended only by the 1950's. He published numerous novels, short stories, essays, senarios, articles, reviews. In all, he had a bibliography that would have filled more than 200 printer's sheets. Beljaev's writing career lasted some fifteen years. See A. F. Britikov, Russkij sovetskij naučno-fantastičeskij roman (Leningrad, 1970), p. 105. [One printer's sheet equals sixteen pages.]

[3]"Novels appeared dealing with problems of biology (S. Beljaev, V. Bragin), chemistry (N. Lukin), geography and ethnography (L. Platov, A. Podsosov), and with the possibility to change climate (A. Kazancev, A. Podsosov, G. Adamov)" A. Britikov, Russkij sovetskij . . ., p. 180.

[4]Britikov, Russkij sovetskij . . ., p. 191.

[5]S. Ivanov wrote: "The writer is alien to cosmic depths and surrealistic inventions . . . the setting for the action is a simple experimental laboratory. The thoughts and action of the characters are directed towards the invention of practical things that tomorrow will enter into practical use" ("Fantastika i dejstvitle'nost,'" Oktjabr', No. 1, 1950, p. 159.

[6]Britikov, Russkij sovetskij . . ., p. 187.

[7]Some portions of the novel were originally serialized in Texnika-moledezi, No. 1-10.

[8]I. Efremov, "Nauka i naučnaja fantastika," Fantastika 1962 (Moscow, 1962), p. 479.

[9]Ibid., p. 473.

[10]I. Efremov, "Milljardy granej buduščego," Komsomol'skaja pravda (January 28, 1966), p. 17.

[11]I. Efremov, Fantastika 1962, p. 470. A Britikov notes some statistics which prove the extent of popularity

of the science fiction genre in the Soviet Union. In 1963 there were more than 80 science fiction publications not counting the translations. In 1965--315 publications. Between 1959 and 1965 there were 1,266 published Russian science fiction works with a circulation of 140,000,000. Not only do the usual journals publish science fiction: Znanie-sila and Texnika-molodeži, but other types of journals also print science fiction works. Almanacs and ontologies such as Fantastika 1962 and its subsequent years sometimes with several releases. There are several publishing houses which put out science fiction works and articles on science fiction: Molodaja gvardija; NF almanax naučnoj fantastiki by Znanie; V mire fantastika i priključenij by Lenizdat. Soviet science fiction is discussed on the most representative conferences--the All Union, and the International. All the major Soviet newspapers have theoretical and ideological debates on science fiction (Britikov, Russkij sovetskij . . ., pp. 268-69).

[12]Komsomol'skaja pravda, January 28, 1961.

[13]"Kak sozdavalsja 'Čas Byka,'" Molodaja gvardija, interview with I. Efremov, No. 5 (Moscow, 1968), pp. 307-308.

[14]Komsomol'skaja pravda.

[15]Efremov, Na kraju Ojkumeny (Moscow, 1949), p. 69.

[16]Efremov, "Serdce zmei," Serdce zmei (Moscow, 1964), p. 203.

[17]Efremov, "Stellar Ships," Stories, trans. O. Gorčakov (Moscow, 1954), p. 228.

[18]See Chapter III in this manuscript.

[19]Efremov, Tumannost' Andromedy (Moscow, 1958), p. 116.

[20]Ibid.

[21]Komsomol'skaja pravda.

[22]Tumannost' Andromedy, pp. 68, 193, 225, 235.

[23]Ibid., pp. 52, 53, 138, 158, 190.

[24]"Kak sozdavalsja 'Čas Byka,'" p. 308.

[25]Čas Byka, p. 3.

[26]Ibid.

[27]"Kak sozdavalsja 'Čas Byka,'" p. 309, also Čas Byka, p. 3.

[28]Čas Byka, pp. 3 and 4.

[29]"Kak sozdavalsja 'Čas Byka,'" p. 308.

[30]"Intervju iz akademii gorja i radosti," Texnika-molodeži, [interview with I. Efremov], No. 1 (Moscow, 1971), p. 19.

[31]Ibid.

[32]Fantastika 1962, p. 472.

[33]Ibid.

[34]Ibid., p. 478.

[35]Komsomol'skaja pravda.

[36]Ibid., col. 3.

[37]See Chapter II in this manuscript.

[38]Fantastika 1962, p. 478.

[39]Komsomol'skaja pravda.

[40]Ibid., col. 4.

[41]Ibid., col. 4.

[42]Ibid.

[43]Ibid.

[44]Čas Byka, p. 13.

[45]Ibid. The Hour of the Bull reflects the Soviet position towards the West, China (Republic of), and Stalinism. The Bull is the collective image of the "Demon"--see pp. 10, 171, 443, and in The Andromeda Nebula for a complete description of the Bull, p. 261.

[46]A Britikov writes that the direct incitement for Efremov to write the novel was "polemical motivation." Efremov came to read much of the Western science fiction and was astonished by the anti-humanism. (Russkij sovetskij. . . . , p. 231).

[47]A. Britikov, p. 249. See Murray Leinster, "First Contact," First Contact, Damon Knight, ed. (New York: Pinnacle Books, 1971), pp. 9-44.

[48]Efremov, "Serdce zmei," pp. 106-107.

[49]The War of the Worlds (1898).

[50]Aèlita (1922).

[51]Britikov, Russkij sovetskij . . ., p. 63.

[52]Tumannost' Andromedy, p. 165.

[53]Ibid., p. 213.

[54]Ibid.

[55]In Stellar Ships Professor Davidov's deduction about the appearance of extraterrestrial visitors on Earth some 70,000,000 years ago is confirmed by an accidental refraction of light from an unearthed oliptical disk. " . . . There looked at them a strange but undoubtedly human face. Its dominating features were its huge prominent eyes, which looked straight ahead. They were like pools reflecting the eternal mystery of creation, glowing with intelligence and an intense will like two powerful

rays. . . . In those eyes, there burned the light of the boundless courage of reason, unabashed by the awareness of the ruthless laws of the universe reveling in the agonies and the joys of knowledge" (Stories, p. 259).

In The Andromeda Nebula, extraterrestrials either resemble Earth people in every way but have a red skin (p. 63) or on the planet of the Iron star, the Earth expedition encounters "meduzas" and a "black cross with wire arms and a thick elliptical protrusion in the middle" (p. 105), with highly electrically charged bodies.

Aliens in Cor Serpentis resemble Earth people in their physical appearance, but they breathe fluorine instead of oxygen. These fluorine people's skin is "iron-grey with silvery shine and an inner blood-red gleam like polish hematitue, . . . their eyes were incredibly large and long with sharply slanted lids toward the temples at the outer courners and took up the whole width of the face, and were set higher in the head than the eyes of Earthman. The whites were deep turquoise in color. . . . Four fingers on each hand, and the fingers did not seem to have joints since they bent freely without forming angles" ("Serdce zmei," Serdce zmei, pp. 235-236).

Efremov mentions the existence of several planets throughout the universe which possess civilizations similar to the one on Earth and all the members of those civilizations resemble Earthman (The Hour of the Bull).

[56]"Serdce zmei," p. 214.

[57]Tumannost' Andromedy, p. 214.

[58]Ibid., p. 213.

[59]Ibid.

[60]Komsomol'skaja pravda.

[61]Ibid.

Chapter II

[1]"Nauka i naučhaja fantastika," Fantastika 1962, p. 472.

[2]Ibid., p. 472.

[3]Komsomol'skaja pravda, January 28, 1966, p. 17.

[4]Fantastika 1962, p. 474.

[5]Ibid., p. 472.

[6]Ibid., pp. 474-475.

[7]Ibid., p. 472.

[8]Cor Serpentis and The Hour of the Bull. The latter one has a footnote indicating that the source and definition of the phantastic terms are found in the novel The Andromeda Nebula (p. 11).

[9]Tumannost' Andromedy, p. 4.

[10]Ibid., pp. 146-148. V. Ambračmyj notes that the mathematician is actually a physicist. ("Kritičeskij tuman vokrug 'Tumannosti Andromedy,'" Literaturnaja gazeta, (August 29, 1959).

[11]M. Gell-Mann and E. P. Rosenbaum, "Elementary Particles," Scientific American (July, 1957), p. 78.

[12]Tumannost' Andromedy, p. 367.

[13]A. Einstein and L. Infeld, The Evolution of Physics (Mass.: A Clarion Book, Simon and Schuster, 9th printing, 1938), p. 191.

[14]Tumannost' Andromedy, p. 367.

[15]Ibid.

[16]Ibid.

[17]G. Gamow, "The Exclusion Principle," Scientific American (July, 1959), p. 78. See also the "Pauli Principle," and the "Exclusion and Antimatter" sections, ibid., p. 76.

[18]Čas Byka, pp. 15-16.

[19]"Serdce zmei," p. 190.

[20]Ibid., p. 188.

[21]If in a non-science fiction literature an occurrence described conforms to everyday experience, an explanation is not usually required. For example: a training covering a distance of fifty miles an hour is an occurrence which corresponds to everyday experience. But a statement such as "X went by train a distance of fifty miles in three minutes . . . " will require an explanation since the occurrence is uncommon to everyday experience.

[22]"Serdce zmei," p. 189.

[23]Ibid., p. 229.

[24]Energy is derived by the process of combustion. The four most chemically active elements known are: hydrogen, oxygen, nitrogen, and carbon. Of these, oxygen is the most effecient for combustion and oxidation. Oxygen is then considered to be most likely to be the basic element for the evolution towards higher life forms. Evidence seems to support the conclusion that fluorine's chemical properties would not be the basis for life, not to speak about intelligent life. See H. S. Jones, Ph.D., Life on Other Worlds (New York: Mentor Book, The New American Library, 1962), pp. 34, 35; Walter Sullivan, We Are Not Alone (New York: A Signet Book, The New American Library, 1966), p. 98f.

H. Jones mentions that there is another possible source of energy which can be tapped by some living organisms--the process of fermentation (p. 34). But fermentation is a far more inferior method for providing energy than by the process of combustion (p. 35).

[25]"Serdce zmei," p. 123.

[26]Ibid., p. 214.

[27]Tumannost' Andromedy, p. 205.

[28]Ibid., p. 204.

[29]Čas Byka, p. 42.

[30]Tumannost' Andromedy, p. 170.

[31]Ibid., p. 174.

[32]Fantastika 1962, p. 475.

[33]Ibid., p. 418.

[34]Čas Byka, pp. 297-298.

[35]Fantastika 1962, p. 475.

[36]Ibid.

[37]Ibid.

[38]Ibid.

[39]Čas Byka, p. 314.

[40]Fantastika 1962, p. 477.

[41]Ibid.

[42]"Velikoe kol'co buduščego," Fantastika 69-70, [interview with I. Efremov] (Moscow: Molodaja Gvardija, 1970), p. 271.

[43]Ibid.

[44]Ibid.

[45]Ibid.

[46]Fantastika 1962, p. 479.

[47]Fantastika 69-70, p. 272.

[48]Čas Byka, p. 134.

[49]Ibid., p. 315.

[50]Ibid., p. 316.

[51]Ibid.

[52]Ibid., p. 395.

[53]Fantastika 69-70, p. 261.

[54]Albert Einstein and L. Infeld, The Evolution of Physics (Mass.: A Clarion Book, Simon and Schuster, 1938, 9th Printing), p. 186.

[55]Parsec equals 3.26 light years.

[56]"Serdce zmei," p. 220.

[57]Ibid., p. 196.

[58]"Stellar Ships," Stories, trans. O. Gorchakov, pp. 222-223.

[59]"Serdce Zmei," p. 220.

[60]Ibid., p. 201.

[61]Tumannost' Andromedy, p. 248.

[62]Čas Byka, p. 173.

[63]Ibid.

[64]Ibid., p. 282.

[65]Tumannost' Andromedy, p. 198.

[66]"Serdce zmei," p. 199.

[67]Tumannost' Andromedy, p. 104.

[68]Ibid., p. 335.

[69]*Ibid.*, p. 335.

[70]*Ibid.*, p. 351.

[71] Serdce zmei," p. 195.

[72]*Tumannost' Andromedy*, p. 365.

[73]"Serdce zmei," p. 189.

[74]*Čas Byka*, p. 94.

[75]*Ibid.*

[76]*Ibid.*, p. 98.

[77]"Serdce zmei," p. 196.

[78]*Ibid.*, p. 189.

[79]*Ibid.*

[80]*Ibid.*, p. 186.

[81]*Ibid.*, pp. 187, 188, 210.

[82]*Ibid.*, p. 195.

[83]*Ibid.*, pp. 189, 194.

[84]*Ibid.*, p. 186.

[85]*Ibid.*, p. 187.

[86]*Ibid.*, p. 197.

[87]*Ibid.*

[88]*Ibid.*, p. 199.

[89]*Ibid.*, p. 200.

[90] Ibid., pp. 225-226.

[91] Ibid., p. 226.

[92] Ibid.

[93] Čas Byka, p. 94.

[94] Ibid., p. 120.

[95] Ibid., p. 118.

[96] Ibid., p. 304.

[97] Ibid., pp. 125, 257.

[98] Ibid., p. 218.

[99] Ibid., p. 148.

[100] Ibid., p. 272.

[101] Ibid., p. 330.

[102] Ibid., p. 337.

[103] Ibid., p. 430.

[104] Ibid., pp. 222, 433.

[105] Tumannost' Andromedy, p. 26.

[106] Ibid., p. 262.

[107] Ibid., p. 51.

[108] Čas Byka, p. 194.

[109] Tumannost' Andromedy, p. 94.

[110] Čas Byka, p. 95.

[111] Ibid., p. 98.

[112] Tumannost' Andromedy, pp. 347, 40.

[113] Ibid., p. 257.

[114] Ibid., p. 22.

[115] Cas Byka, p. 11.

[116] Ibid., p. 29.

[117] Ibid., p. 40.

[118] Tumannost' Andromedy, p. 236.

[119] Ibid., p. 38.

Chapter III

[1] Known also as "dystopian" and "contra-utopian."

[2] The major known anti-utopists are: E. M. Forester: The Machine Stops, E. Zamjatin: We, Aldous Huxley: Brave New World, George Orwell: Nineteen Eighty Four.

[3] F. E. Manuel, "Towards a Psychological History of Utopias," Daedalus, Vol. 94, No. 2 (Boston: Spring, 1965), p. 310.

[4] F. E. Manuel mentions some writers in various fields who try to solve the Darwinian and Freudian dilemma, among them: Teilhard de Chardin: Phenomenon of Man, Julian Huxley, Eric Fromm: Beyond the Chains of Illusions, H. Marcuse: Eros and Civilization, A. Maslow: Toward a Psychology of Being (Manuel, ibid., pp. 310-322).

[5] The similarities between the philosophical approach of Teilard the Chardin's and that of I. Efremov are most striking. Teilard de Chardin begins with Julian Huxley's premise that "the universe is becoming conscious of itself through a new step in evolution" (J. Huxley,

Knowledge, Morality and Destiny, p. 13)(Teilhard de Chardin, The Phenomenon of Man, p. 220). Man is now evolving not so much on the biological as on the social and cultural level --a new organic organization is created (Teilhard de Chardin, The Future of Man, pp. 39-40) leading Man to an interwoven consciousness which is called "The Noosphere" (The Future of Man, p. 169). This Man is superhuman (The Phenomenon of Man, p. 244) is set in contrast to the former bourgeois self-centered Man. The New Man consciously unites in a greater whole (The Future of Man, p. 51) and by being aware of science, he is now master of his fate, and can but move forward (The Phenomenon of Man), p. 229).

[6]Fantastika 69-70, p. 264.

[7]Ibid.

[8]Ibid.

[9]Čas Byka, p. 251.

[10]Fantastika 69-70, p. 264.

[11]Ibid.

[12]Ibid.

[13]Ibid.

[14]Ibid.

[15]Čas Byka, p. 418.

[16]Fantastika 69-70, p. 265.

[17]"Intervju iz akademii gorja i radosti," Texnika-moledezi [interview with I. Efremov], No. 1 (Moscow, 1971), p. 19.

[18]Term used by C. Walsh, From Utopia to Nightmare (London: Cox and Wyman, Ltd., 1962), p. 76.

[19]Komsomol'skaja pravda, January 28, 1966, p. 17.

[20]Ibid.

[21]"Kak sozdavalsja 'Čas Byka,'" Molodaja gvardija, [discussion with I. Efremov], No. 5 (Moscow, 1969), p. 310.

[22]Čas Byka, p. 393.

[23]Fantastika 69-70, p. 269.

[24]Čas Byka, p. 27.

[25]Fantastika 69-70, p. 264.

[26]Ibid.

[27]Ibid.

[28]Čas Byka, p. 395.

[29]"Intervju iz akademii gorja i radosti," Texnika-molodeži, p. 19.

[30]Ibid., col. 1.

[31]Ibid.

[32]Čas Byka, p. 394.

[33]Ibid.

[34]Ibid.

[35]Ibid.

[36]Fantastika 69-70, p. 270.

[37]Ibid.

[38]Ibid.

[39]Ol'ga Larionova, Ostrov mužestva, [introduction by I. Efremov] (Leningrad, 1971), p. 5.

[40]"Intervju iz akademii gorja i radosti," Texnika-molodeži, col. 1.

[41]Ostrov mužestva, [introduction by I. Efremov], p. 5.

[42]"Intervju iz akademii gorja i radosti," Texnika-molodeži, col. 1.

[43]Ibid., col. 3.

[44]Ibid.

[45]Fantastika, p. 478.

[46]Ibid., p. 479.

[47]Fantastika 69-70, p. 271.

[48]Ibid.

[49]Ibid.

[50]Ostrov mužestva, p. 6.

[51]Ibid., p. 5.

[52]"Intervju iz akademii gorja i radosti," Texnika-molodeži, col. 3.

[53]Fantastika 69-70, p. 257.

[54]Ibid.

[55]Ibid., p. 258.

[56]Ibid.

[57]Ibid.

[58]Ibid.

[59] Ibid.

[60] Fantastika 69-70, p. 259.

[61] Ibid.

[62] Ibid.

[63] "Serdce zmei," p. 203.

[64] Tumannost' Andromedy, p. 227.

[65] Ibid., p. 228.

[66] Čas Byka, p. 14f.

[67] Ibid., p. 11.

[68] Tumannost' Andromedy, p. 224.

[69] Ibid., p. 229.

[70] Ibid., p. 224.

[71] Čas Byka, p. 10.

[72] Fantastika 69-70, p. 260, also Čas Byka, p. 314.

[73] Fantastika 69-70, p. 260.

[74] Ibid., p. 260.

[75] Ibid., p. 261.

[76] Ibid., p. 262.

[77] Ibid., p. 265.

[78] Tumannost' Andromedy, p. 48.

[79] Ibid.

[80] Ibid.

[81] Ibid., p. 49.

[82] Ibid.

[83] Ibid.

[84] Ibid., pp. 49-50.

[85] Tumannost' Andromedy, p. 50.

[86] Čas Byka, p. 17.

[87] Ibid., p. 233.

[88] Tumannost' Andromedy, p. 234.

[89] Čas Byka, p. 105.

[90] Ibid.

[91] Ibid., pp. 105-106.

[92] Ibid., p. 105.

[93] Ibid.

[94] Ibid.

[95] Tumannost' Andromedy, p. 234.

[96] Čas Byka, p. 131.

[97] Ibid., p. 86.

[98] Ibid.

[99] Ibid.

[100] Ibid.

[101] Ibid.

[102] Tumannost' Andromedy, pp. 231-232.

[103] Ibid., p. 231.

[104] Ibid.

[105] Ibid.

[106] Ibid., p. 232.

[107] Čas Byka, p. 112.

[108] Ibid., p. 288.

[109] This exact theme and mistake was developed by V. Savčenko in his science fiction work Black Stars. (V. Savčenko, "Černye zvezdy," Mir priključenij. Al'manax, No. 4 (Moscow: Detgiz, 1959), pp. 115-193.

[110] Tumannost' Andromedy, p. 51.

[111] Ibid., p. 53.

[112] Ibid., p. 51.

[113] Ibid., p. 138.

[114] Ibid., p. 53.

[115] Ibid., p. 111.

[116] Ibid., p. 53.

[117] Ibid., p. 280.

[118] Ibid., p. 187.

[119] Ibid., p. 52.

[120] Ibid.

[121] Ibid., p. 50.

[122] Ibid.

[123] Ibid.

[124] Ibid.

[125] Ibid., pp. 346-347.

[126] Ibid., p. 347.

[127] Čas Byka, p. 95.

[128] Ibid., p. 414.

[129] Tumannost' Andromedy, p. 52.

[130] Čas Byka, p. 194.

[131] Tumannost' Andromedy, p. 254.

[132] Ibid., p. 51.

[133] Čas Byka, p. 195.

[134] Ibid.

[135] Tumannost' Andromedy, p. 109.

[136] Ibid., p. 330.

[137] Ibid., p. 257.

[138] Ibid., p. 186.

[139] Ibid., p. 253.

[140] Čas Byka, p. 197.

[141] Ibid.

[142] Ibid., p. 202.

[143] Ibid.

[144] Tumannost' Andromedy, p. 233.

[145] Ibid., pp. 198-199.

[146] In the work The Hellenic Secret, Efremov describes a young sculptor who while working over his sculpture, receives the solution to a chemical formula for the wax through the medium of a series of dreams. These dreams are found to be initiated by memory cell patterns which were inherited--transmitted from one generation to the next for two thousand years [I. Efremov, "Ellinskij sekret," Ellinskij sekret, ed., E. Brandis, and V. Dmitrevskij (Leningrad, 1966), pp. 305-327].

[147] Tumannost' Andromedy, p. 233.

[148] Ibid., p. 252.

[149] Ibid.

[150] Čas Byka, p. 173.

[151] Tumannost' Andromedy, p. 253.

[152] Ibid., p. 199.

Chapter IV

[1] Efremov, "Milljardy granej buduščego," Komsomol'skaja pravda, January 28, 1966.

[2] Efremov admits that his early literary works prior to Stellar Ships were of this quality. Efremov calls this kind of science fiction--Science adventure

literature ["Nauka i naucnaja fantastika, Fantastika 1962 (Moscow, 1962), p. 479].

[3]"Kak sozdavalsja 'Čas Byka,'" Molodaja gvardija, No. 5 (Moscow, 1969), p. 313.

[4]Ibid.

[5]Ibid.

[6]Ibid.

[7]Ibid., p. 317.

[8]Ibid.

[9]Ibid.

[10]Ibid.

[11]Ibid.

[12]Ibid., pp. 313-314.

[13]Ibid., p. 314.

[14]Čas Byka, p. 282.

[15]Ibid., p. 283.

[16]Ibid., pp. 283-284.

[17]Čas Byka, p. 283.

[18]Ibid.

[19]Ibid., p. 173.

[20]Ibid.

[21]Tumannost' Andromedy, p. 177.

[22]*Ibid.*

[23]*Ibid.*, p. 178.

[24]"Serdce zmei," *Serdce zmei*, p. 212.

[25]*Ibid.*, p. 213.

[26]*Tumannost' Andromedy*, p. 178.

[27]*Ibid.*

[28]*Ibid.*, p. 140.

[29]*Ibid.*, pp. 178-179.

[30]*Ibid.*, p. 144.

[31]*Ibid.*

[32]*Ibid.*, p. 214.

[33]*Ibid.*, p. 141.

[34]*Ibid.*, p. 179.

[35]*Ibid.*, p. 141.

[36]*Ibid.*, p. 179.

[37]*Ibid.*, p. 40.

[38]*Ibid.*, p. 22.

[39]*Ibid.*, p. 43.

[40]*Cas Byka*, p. 173.

[41]*Tumannost' Andromedy*, p. 43.

[42]Ibid., pp. 314-315.

[43]Tumannost' Andromedy, pp. 24-25.

[44]Ibid., p. 192, also p. 73.

[45]Ibid., p. 315.

[46]Tumannost' Andromedy, p. 192.

[47]"Magija geroja," Literaturnaja gazeta (Moscow, January 29, 1969).

[48]This parallel can be drawn between two kinds of scientists that Efremov distinguishes above--the "conservative" analytical type and the scientist "allotted with a great and live imagination" who dream in science (Fantastika 1962, pp. 475-476).

[49]Tumannost' Andromedy, p. 323.

[50]Ibid.

[51]Ibid., p. 5.

[52]Ibid., pp. 5-6.

[53]Ibid., p. 6.

[54]Ibid., p. 7.

[55]Ibid., p. 316.

[56]Ibid., p. 315.

[57]Ibid., p. 9.

[58]Ibid., p. 323.

[59]Ibid., p. 193.

[60]Ibid., p. 37.

[61]Ibid., p. 41.

[62]Ibid., p. 68.

[63]Ibid., p. 216.

[64]Britikov, p. 260.

[65]Tumannost' Andromedy, p. 133.

[66]Čas Byka, p. 173.

[67]Ibid.

[68]"Kak sozdavalsja 'Čas Byka,'" Molodaja gvardija, No. 5 (Moscow, 1969), pp. 313-314.

[69]Čas Byka, p. 314.

[70]Ibid., p. 314.

[71]"Kak sozdavalsja 'Čas Byka,'" Molodaja gvardija, pp. 313-314.

[72]Tumannost' Andromedy, p. 16.

[73]Ibid., p. 106.

[74]Ibid., p. 165.

[75]Ibid., p. 164.

[76]"Magija geroja," Literaturnaja gazeta, January 29, 1969.

[77]Čas Byka, p. 127.

[78]Ibid.

[79]Ibid., p. 127.

[80]"Kak sozdavalsja 'Čas Byka,'" Molodaja gvardija, p. 315.

[81]Tumannost' Andromedy, p. 179.

[82]Čas Byka, pp. 29-30.

[83]Ibid., pp. 30, 98, 99.

[84]Ibid., pp. 166.

[85]Ibid., p. 366.

[86]Ibid., p. 168.

[87]Ibid., p. 39.

[88]Ibid., p. 40.

[89]Ibid., p. 167.

[90]Ibid., p. 272.

[91]Ibid., pp. 191-192.

[92]Ibid., p. 191.

[93]Ibid., pp. 334, 346.

[94]Ibid., p. 355.

[95]Ibid., p. 138.

[96]Ibid., p. 327.

[97]Ibid.

[98]Ibid., p. 267.

[99]Ibid., p. 326.

[100]*Ibid.*, p. 301.

[101]*Ibid.*, p. 111.

[102]*Ibid.*

[103]*Ibid.*, p. 165.

[104]*Ibid.*, p. 111.

[105]*Ibid.*, pp. 39-40.

[106]*Tumannost' Andromedy*, p. 319.

[107]*Ibid.*, p. 320.

[108]*Ibid.*, p. 321.

[109]*Ibid.*, p. 4.

[110]"Milljardy graneji buduščego," *Komsomol'skaja pravda*, January 28, 1966.

[111]*Čas Byka*, p. 175.

[112]*Ibid.*, p. 263.

[113]*Ibid.*, p. 301.

[114]*Ibid.*, p. 412.

[115]*Ibid.*, p. 302.

[116]*Ibid.*, p. 406.

[117]*Ibid.*, p. 404.

[118]*Ibid.*, p. 350.

[119]*Ibid.*

[120]*Ibid.*

[121]"Serdce zmei," Serdce zmei, p. 196.

[122]Tumannost' Andromedy, p. 261.

[123]Čas Byka, p. 192.

[124]Ibid., p. 269.

[125]Ibid., p. 379.

[126]Ibid., p. 170.

[127]Ibid., p. 239.

[128]Ibid., p. 240.

[129]Ibid., p. 236.

[130]Ibid., pp. 242-243.

Chapter V

[1]Carl G. Hempel, Philosophy of Natural Science (New Jersey: Prentice-Hall, Inc., 1966), p. 77.

[2]Ibid., p. 72.

[3]Richard S. Rudner, Philosophy of Social Science (New Jersey: Prentice-Hall, Inc., 1966), p. 60.

[4]Herbert Feigl notes the distinction between ex post facto explanations which do not have predictive power, and those who do as well as retrodictive and explanations ["The 'Mental' and the 'Physical,'" Minnesota Studies in the Philosophy of Science, Vol. III, ed. H. Feigl, M. Scriven, and G. Maxwell (Minneapolis: University of Minnesota Press, 1958), p. 384].

[5]Fred Charles Iklé, "Can Social Predictions Be Evaluated," Daedalus, Vol. 96, No. 3 (Mass.: American Academy of Arts and Sciences, Summer, 1967), p. 741.

[6]The more recent ones among books: "Toward the Year 2000: Work in Progress," Daedalus, Summer, 1967. K. Baier and N. Rescher, Values and the Future (New York: The Free Press, 1969); Nigel Calder, Technopolis (London: Panther Books, 1970), John McHale, The Future of the Future (New York: Ballantine Books, 1971); Alvin Toffler, Future Shock (New York: Random House, Inc., 1970). Bibliographies are extensive in these books. Robert Nisbet, "Has Futurology a Future?" Encounter, Vol. xxxii, No. 5 (London: Encounter, Ltd., November, 1971).

[7]Daedalus, Summer, 1967, Futureables Project in Paris in 1960, Major "think tanks" such as Hudson Institute, RAND Corporation, Systems Development Corporation, Institute of Defense Analysis. In the Soviet Union: The State Committees for Science and Technology and Social Forecasting Research Institute of the Soviet Sociological Association. (J. McHale, The Future of the Future.) Numerous major private companies who take forecasting seriously: ASEA (Sweden), The Bell System, Boeing, ESSO (U.K.), General Electric, IBM, etc., it is estimated that American industry alone is spending $60-65 million a year on technological forecasting. (N. Calder, Technopolis, p. 297.)

[8]N. Calder, Technopolis, p. 298, and K. Baier and N. Rescher, eds., Values and the Future, p. 104.

[9]Values and the Future, p. 104.

[10]N. Rescher, "What is Value Change? A Framework for Research," Values and the Future, pp. 105, 106.

[11]The Delphy method of Olaf Helmer at RAND Corporation is a method which consists of polling expert panels and the probablistic weighting assigning possibilities to futures by the experts in their field.

[12]Technolpolis, p. 301.

[13]Ibid., p. 302.

[14]Ibid.

[15]"Intervju iz akademii gorja i radosti," Texnika-molodeži, No. 1 (Moscow, 1971), p. 19. col. 1. Olga Larinova, Ostrov mužestva [introduction by I. Efremov], (Leningrad, 1971), p. 6.

[16]F. C. Iklé, "Can Social Predictions Be Evaluated?" Daedalus, Summer, 1967, p. 746.

[17]Ibid., p. 747.

[18]Arnold Brecht, Political Theory: The Foundations of Twentieth-Century Political Thought (New Jersey: Princeton University Press, 1967), pp. 55-63, 126-128.

[19]Fantastika 1969-1970, p. 260.

[20]Ibid., p. 261.

[21]James Gutmann, Philosophy A to Z (New York: Grosset and Dunlap, Inc., 1963), p. 176.

[22]H. Feigl and G. Maxwell, Current Issues in the Philosophy of Science (New York: Holt, Rinehart and Winston, Inc., 1961), pp. 1-17.

[23]Karl W. Deutsch, The Nerves of Government: Models of Political Communication and Control (New York: A Free Press Paperback, The Macmillan Company, 1966), pp. 3, 4.

[24]Karl W. Deutsch, "Mechanism, Teleology, and Mind: The Theory of Communications and Some Problems in Philosophy and Social Science," [lecture given on May 13, 1950 to the Fullerton Club at Bryn Mawr College], Space, Time, and the New Mathematics, ed. Robert W. Marks (New York: Bantam Books, 1964), pp. 220-226.

[25]Ibid., p. 226. Cybernetics--Norbert Wiener. See also K. W. Deutsch's Nerves of Government, p. xv.

[26]"Kak sozdavalsja 'Čas Byka,'" Molodaja gvardija [interview with I. Efremov], No. 5 (Moscow, 1969), p. 313.

[27]Čas Byka, p. 251 and Fantastika 69-70, p. 264.

[28]Tumannost' Andromedy, pp. 73-74.

[29]Čas Byka, p. 116.

[30]Robert Boguslaw, The New Utopians: A Study of System Design and Social Change (New Jersey: Prentice-Hall, 1965).

[31]Robert W. Marks, "Mind, Nature, and Cybernetics," Great Ideas in Modern Science, R. W. Marks, ed. (New York: Bantam Books, 1967), p. 251.

[32]Ibid., p. 249.

[33]Ibid., p. 248.

[34]Karl W. Deutsch, The Nerves of Government: Models of Political Communication and Control (New York: The Free Press, 1966), pp. 76-77.

[35]W. R. Ashby, An Introduction to Cybernetics (New York: John Wiley and Sons, Inc., 1963), p. 1.

[36]Robert W. Marks, "Negative Malthusianism: The Mathematics of Maximized Abundance," Space, Time, and the New Mathematics (New York: Bantam Books, Inc., 1964), p. 263.

[37]D. Rudnev, "'Zamknutyj mir' sovremennoj russkoj fantastiki," Grani, No. 78, 1970, p. 168.

[38]Karl W. Deutsch, "The Future of World Politics," Issues in Politics and Government, Bell, Deutsch, Lipset, eds. (Boston: Houghton Mifflin Co., 1970), pp. 354-356.

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