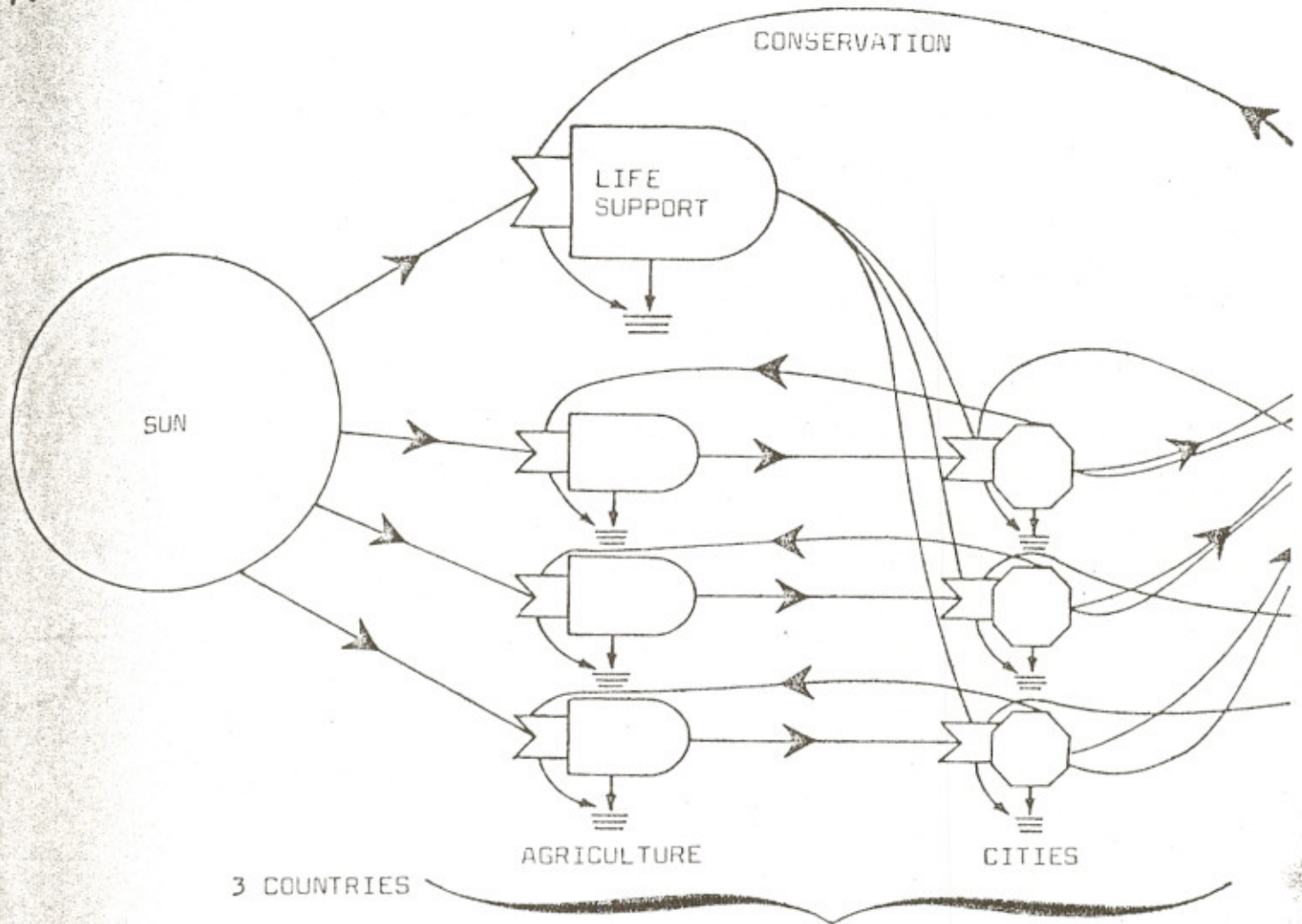


A PRINT-OUT OF THE FUTURE SYSTEMS



THE FUTURE OF MAN ON EARTH CAN BE DIVIDED INTO ALTERNATIVES ACCORDING TO ENERGY SUPPLIES. THERE IS THE FUTURE OF POWER EXPANDING, THE FUTURE OF POWER CONSTANT, AND THE FUTURE OF POWER RECEDED. NATIONAL AND INTERNATIONAL PLANNING TASK FORCES SHOULD BE ASSIGNED TO EACH OF THE THREE CONTINGENCIES.

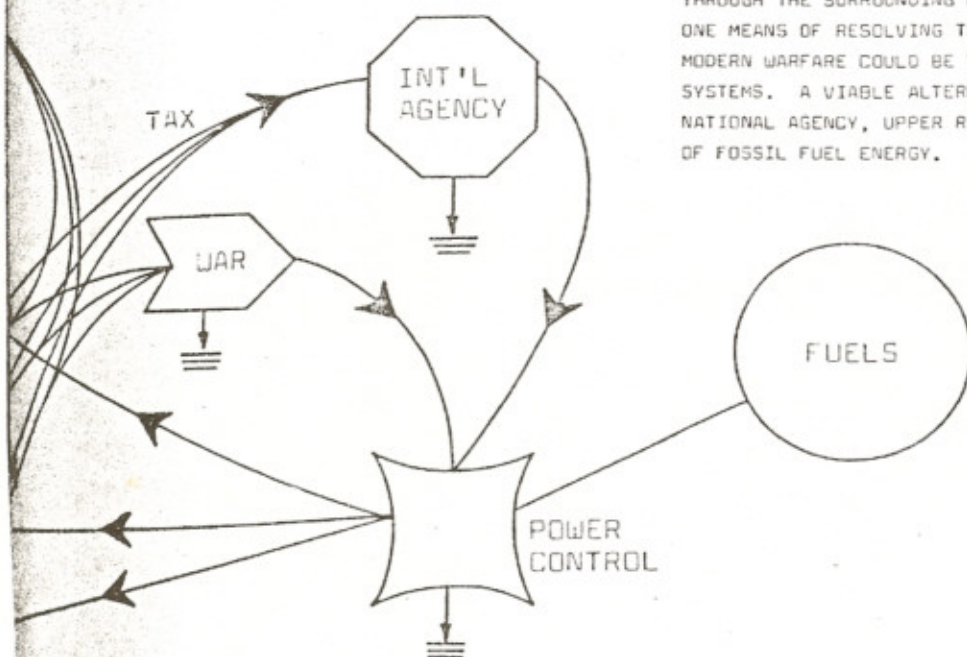
WE ARE NOT NOW SURE WHICH FUTURE WILL BE NEXT; PERHAPS EACH WILL FOLLOW THE OTHER IN A STEP-BY-STEP SEQUENCE, FROM THE PRESENT SYSTEM OF EXPANDING POWER, TO CONSTANT POWER, TO RECEDED POWER. THESE ENERGY ALTERNATIVES CONCERN SURVIVAL AND SHOULD PROBABLY DEMAND FAR MORE OF OUR NATIONAL ATTENTION THAN THE STATUS SYMBOL OF SPACE TRAVEL. THE AVAILABILITY OF ENOUGH ENERGY FOR ANY SIG-

NIFICANT AMOUNT OF SPACE ACTIVITY IS SIMPLY NOT IN SIGHT. THE SPACE PROGRAM MAY INDEED BE A LOVELY FLOWER IN THE LATE SUMMER OF MAN'S CURRENT GROWING SEASON. WE HAVE ENERGY NOW TO PLAN FOR THE FUTURE, BUT LATER THERE MAY BE NO EXCESS CALORIES.

FUTURE OF POWER EXPANDING

AS LONG AS SUSTAINED AND INCREASING SOURCES OF POTENTIAL ENERGY ARE DEVELOPED FROM FOSSIL FUELS AND NUCLEAR POWER, THERE WILL BE ADVANCING PATTERNS OF MORE COMPLEX, SELF-ADJUSTING NETWORKS OF MAN. IF AN AWARE-

OF MAN



IN THIS ABSTRACT DIAGRAM, ENERGY FLOWS FROM TWO SOURCES, THE SUN AND FUELS, TO MANY ENERGY SINKS, REPRESENTED BY INVERTED TRIANGLES. THE ENERGIES FLOW THROUGH THE AGRICULTURE AND CITIES OF THREE COMPETING COUNTRIES AND THROUGH THE SURROUNDING LIFE-SUPPORT SYSTEM. WAR IS ONE MEANS OF RESOLVING THE COMPETITION FOR ENERGY, BUT MODERN WARFARE COULD BE TOO DESTRUCTIVE TO ALL LIVING SYSTEMS. A VIABLE ALTERNATIVE WOULD BE FOR AN INTERNATIONAL AGENCY, UPPER RIGHT, TO CONTROL THE ALLOCATION OF FOSSIL FUEL ENERGY.

NESS OF ENERGY LAWS CAN BE BETTER DISPERSED AMONG THE WORLD'S CITIZENS, SOME IMPROVED DESIGNS OF POLITICAL STRUCTURE MAY YET DEVELOP A ONE-WORLD SYSTEM, BYPASSING MILITARY POWER TESTING. HOWEVER, FOR SUCH A ONE-WORLD STRUCTURE THE SCIENCE OF ENERGY NETWORKS IN HUMAN SYSTEMS MUST BE URGENTLY ADVANCED. FOR SURVIVAL WE MAY NEED TO DEVELOP SUCH NATIONAL PROJECTS AS A GIANT ANALOG NETWORK MODEL FOR SIMULATING, IN DETAIL, MAN'S SYSTEM OF ENERGY AND ECONOMICS.

THE INCOMPLETE LOOPING OF MATERIALS IS A GREAT DANGER. WASTES ACCUMULATE AND MINERALS MAY FAIL TO REACH ENOUGH AGRICULTURE. IF THE WORLD DESIGNS DO NOT REGENERATIVELY CONNECT THE WASTES TO THE FOOD INPUT, BOTH POLLUTION AND STARVATION MAY RESULT AS TWO FACES OF

THE SAME DIFFICULTY IN SYSTEMS DESIGN. THERE IS ALSO THE HAZARD THAT SELF-DESIGNING READJUSTMENTS OF SYSTEMS OCCUR ONLY AFTER CHEMICAL LEVELS TOXIC TO THE BIOSPHERE DEVELOP. THIS COULD ELIMINATE MAN LOCALLY AND POSSIBLY EVEN COMPLETELY. FOR THE ENGINEERING OF BETTER REGENERATIVE ECOSYSTEMS CONSISTENT WITH THE NEW INPUTS OF CIVILIZED MAN, AN INTERNATIONAL ECOLOGICAL ENGINEERING PROJECT IS NEEDED THAT, HOPEFULLY, WILL DEVELOP NEW COMBINATIONS OF SPECIES THAT CAN DEAL WITH THE SPECIAL CHEMISTRY INVOLVED.

DURING A FUTURE OF POWER EXPANDING, NEW EDUCATIONAL MEANS WILL BE REQUIRED TO INCORPORATE ALL THE PROBLEMS OF ACCELERATING COMPLEXITY AND TO PROVIDE SENSIBLE ROLES AND PERSPECTIVES FOR EACH CITIZEN. THE SCIENCE OF

GREATER COSTS. TAXES AND COSTS GO UP AND THE ECONOMY BECOMES UNCOMPETITIVE FOR LACK OF NATURE'S FORMERLY FREE SUPPORT. A DILUTE MIXTURE OF TOWNS AND NATURE IS THE FORMULA THAT WINS OUT IN THE LONG RUN, BECAUSE TECHNOLOGY IS NOT AN EFFICIENT SUBSTITUTE FOR BEAUTIFULLY MINIATURIZED SYSTEMS OF LIFE SUPPORT.

RATIONING WORLD FUEL IS A FEARSOME TASK WITH MOST OF THE FUEL SUPPLIES IN THE HANDS OF SMALL, PARTLY DEVELOPED COUNTRIES AND OIL COMPANIES, BOTH OF WHICH OPERATE UNDER SHORT-RANGE PLANNING ONLY. WE HAVE A CHANCE IF WE CAN FIRST EXPLAIN TO THE CITIZENS OF THE WORLD THE UNDERLYING ENERGY CAUSES OF OUR SITUATION. THEN THE ENERGY REFORMS OF INTERNATIONAL LAW CAN FOLLOW. THIS WILL REQUIRE INCORPORATION OF THE ENERGY ETHIC INTO ALL RELIGIOUS PROGRAMS.

IF OUR STRUCTURE OF ECONOMISTS ADVISING OUR PLANNING ENDEAVORS WILL INCORPORATE THE BASIC ENERGY DRIVES IN ENERGY-ECONOMETRIC MODELS, THEN WE MAY SUBSTITUTE MORE CERTAINTY FOR THE HERETOFORE ELUSIVE ABILITY TO PREDICT ECONOMIC DETAILS USING AN INCOMPLETE MODEL. THE RISING LEVELS OF EDUCATION AND ONE-WORLD TELEVISION COMMUNICATION MAY MAKE ALL THIS POSSIBLE.

IF IT IS CORRECT THAT USE OF POTENTIAL ENERGY TENDS TO DEVELOP EQUAL DISTRIBUTIONS IN A NETWORK, GRADUAL EQUALIZATIONS MAY CUT DOWN THE FORCES THRUST ACROSS NETWORK JUNCTIONS BETWEEN POOR AND RICH AREAS. THE STABILITY OF DOMINANT PROTECTORS MAY BE REPLACED BY SOME STABILITY OF INSTITUTIONAL UNIFICATION IN ORDER TO FOCUS ENOUGH POWER FOR WORLD ORGANIZATION.

THE ENERGIES OF WAR ARE THE OLD WAY, APPARENTLY WORKABLE IN PRIMITIVE LOW-ENERGY STATES, OF ADJUSTING INFLUENCE GEOGRAPHICALLY, BUT THESE SYSTEMS WHEN ENERGIZED BECOME THE IMPOSSIBLE HIGH-ENERGY WARS OF OUR RECENT HISTORY. THERE IS SURELY ENOUGH ENERGY AVAILABLE FROM THESE FLOWS TO DEVELOP THE BETTER POWER CONTROL MECHANISMS.

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FUTURE OF POWER CONSTANT

PERHAPS THE MAN-CONTROLLED ENERGY EXPLOSION IS NOT LONG FOR THIS WORLD. THE CURVE OF EXPONENTIALLY RISING ENERGY USE MAY BE CROSSING THE CURVE OF INCREASING COSTS OF FINDING CHEAP NEW ENERGY SOURCES. THE ACTIVITIES INVOLVING ENERGY EXCESSES MAY DISAPPEAR; THEN THE AMOUNT OF STRUCTURE AND USEFUL FUNCTION THAT CAN BE SUPPORTED WILL STOP INCREASING. THERE MAY BE A LONG PERIOD OF LEVELING ENERGY BUDGETS OF A FAIRLY HIGH PLANE, BUT THE EXPANDING ECONOMY MAY BE GONE. THE CITIZEN WILL SENSE THIS PROCESS AS INFLATION. AS IN THE SMALLER NATURAL ECOLOGICAL SYSTEMS WHEN THEY CHANGE FROM SUCCESSIONAL EXPANSION TO STEADY STATE CLIMAX, THE PREMIUM SHIFTS FROM THE FAST GROWING DEVELOPERS TO THOSE THAT DO THE MOST WITH THE LEAST. GROUP-SERVING SPECIALISTS AND DIVERSITY REPLACE COMPETITION, SURGES, AND EXPANSIONS.

A STABILIZATION OF CHANGE MIGHT ALLOW THE CODIFICATION OF YET UNFOUNDED RELIGIOUS FAITHS THAT WOULD CHARACTERIZE THE NEW NETWORKS. POSSIBLY NEW PROPHETS WILL EMERGE FOR RELIGIOUS ADAPTATIONS TO THE COMPLEX MODERN SYSTEMS. AN ADAPTED RELIGION MAY CAUSE GREAT ENERGY ECONOMIES IN THE SWITCHING SYSTEMS THAT DEDICATE PEOPLE TO GROUP CAUSES ULTIMATELY FAVORABLE TO THEMSELVES.

STABILITY ALLOWS COMPLEX DIVERSITY AND UNIQUENESS OF INDIVIDUALS. AS IN AUGUSTINIAN ROME, THERE MAY BE GOLDEN ERAS - IF MEN CAN BE SATISFIED WITH SMALL CAUSES, FOR ENERGIES BIG ENOUGH FOR NEW CAUSES WOULD HAVE TO BE DIVERTED FROM OLDER ENDEAVORS. THIS IN TURN REQUIRES A WILLINGNESS TO DISCARD ACTIVITIES.

A DECLINE IN EXPANSION MAY ALLOW MANY ASPECTS OF EVOLUTION TO CATCH UP IN SELF-DESIGN PROCESSES. THE REGENERATIVE SYSTEM OF NATURE MAY EVOLVE THE ECOSYSTEMS FOR DEALING WITH MAN'S WASTE AND RECIRCULATING THE MATERIALS BACK INTO AGRICULTURE. THE AIR AND WATER MAY AGAIN BE CLEAR.

WITH LEVELING OF ENERGIES, THE HAZARDS OF ENERGY SHORTAGE BEGIN TO DEVELOP IN HIDDEN WAYS. DEVELOPMENT OF MORE NETWORK STRUCTURE AND NEW PROGRAMS REQUIRING MAINTENANCE MAY USE THE ENERGY RESERVES. THEN, IF FLUCTUATIONS AND DEMANDS FOR POWER DELIVERY ARE FORCED UPON THE SYSTEM, AND IF CONTROLS ARE NOT SPECIFICALLY DESIGNED TO PREVENT IT, ENERGIES MAY BE DIVERTED FROM THE ORGANIZATIONAL INSTITUTIONS RATHER THAN FROM INDIVIDUALS. ONCE ORGANIZATION FALTERS, THE COMPONENTS MAY SEPARATE WITH NO ENERGY FOCUS AVAILABLE TO REUNITE THEM. UNDER THIS KIND OF STRESS, SAFETY MAY REQUIRE A RELIGIOUS SWITCHING SYSTEM IN INDIVIDUALS, CAPABLE OF MAKING THEM PUT THE SYSTEM FIRST, SINCE THE ULTIMATE SAFETY OF THE INDIVIDUAL IS IN A STABLE SYSTEM. HIGHLY INDIVIDUALISTIC PRIORITIES AND LOYALTIES MAY BE DANGEROUS IN COMPLEX STATES THAT HAVE NO ENERGY EXCESS.

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FUTURE OF POWER RECEDED

THE FOSSIL RECORD IS FULL OF SYSTEMS THAT ROSE, THEN FELL TO EXTINCTION. BIOLOGICAL SPECIALIZATION IN ORGANIC BODY DEVELOPMENT TENDS TO BE ONE-WAY, WHILE NEW DEVELOPMENTS TEND TO COME FROM THE UNDIFFERENTIATED, UNSPECIALIZED CELLS THAT ARE TUCKED AWAY AMIDST THE POWERFUL MAIN STRUCTURES OF ACTION, SUCH AS MUSCLES AND NERVES. IN ANALOGY WITH THESE FACTS, MANY AUTHORS AFTER HEGEL HAVE SUGGESTED THE DANGERS OF EXTINCTION OF THE MAIN CIVILIZATION THAT MIGHT FOLLOW ANY EFFORT TO DECREASE ITS ACTIVITY. CAN COMPLEX CIVILIZATION BEDIFFERENTIATE? ARE GENERALIZED PARTS SUCH AS THE YOUTH A MEANS FOR PROGRAMMING CHANGE? CERTAINLY IT IS AN IMPORTANT CONTINGENCY TO CONSIDER THE POSSIBLE FUTURE OF CIVILIZATION IF, AND AS, THE ENERGY BUDGETS RECEDE TOWARD THE LEVEL OF ENERGY AVAILABLE FROM SOLAR INCOME.

WE MAY ELIMINATE FEAR OF INEVITABLE DISINTEGRATION AND EXTINCTION BY POINTING TO THE

ORDERLY RISE AND FALL OF MANY ECOSYSTEMS IN RHYTHM WITH THE RISE AND FALL OF THE SEASONAL ENERGY BUDGETS. SYSTEMS SUCH AS CERTAIN TEMPERATE FORESTS AND THE NORTH ATLANTIC ESTUARIES EXPERIENCE A TENFOLD OR GREATER CHANGE IN THEIR ENERGY FLOWS EACH YEAR WITHOUT DESTRUCTION. THESE SYSTEMS HAVE MECHANISMS FOR REDUCING THEIR DRAINS, DIMINISHING THEIR POPULATIONS, DISPERSING CONCENTRATIONS, ARRANGING MIGRATIONS, AND MAINTAINING THEIR GENERAL ORDER IN A MORE DILUTE FORM CONSISTENT WITH THE DIMINISHED ENERGY BUDGET. FOR ANY NATIONAL TASK FORCE ASSIGNED THE RESPONSIBILITY OF PREPARING FOR THE CONTINGENCY OF DECLINING POWER, THE CHALLENGE CONSISTS OF DEVELOPING SUCH A TRANSITION PLAN FOR MAN. THE PATTERN NEED NOT BE SUDDEN COLLAPSE, ALTHOUGH PRECEDENT EXISTS FOR BOTH GRADUAL AND CATASTROPHIC ADJUSTMENT.

WHILE ENERGIES ARE STILL IN EXCESS, ADEQUATE PREPARATIONS CAN BE MADE FOR PRESERVING AND HOLDING THE NEEDED KNOWLEDGE AND CULTURAL MEMORY IN LIBRARIES AND INSTITUTIONS. THEN PLANS CAN BE MADE FOR MORE AGRARIAN SYSTEMS, BENEFITED BY THE KNOWLEDGE WE NOW HAVE ABOUT THEM. WE CAN PLAN FOR SMALLER CITIES, FEWER CARS, GREATER RATIOS OF AGRICULTURAL WORKERS TO TOWN CONSUMERS, AND FEWER POLLUTION PROBLEMS.

POPULATION CAN BE DRASTICALLY CUT BACK AT ANY TIME BY CRASH BIRTH CONTROL EFFORTS IN PROPORTION TO THE EXPECTED ENERGY BUDGET; SUCH A CUTBACK MAY POSSIBLY BE ESSENTIAL TO PREVENT COLLAPSE. IN THIS ADJUSTMENT MAN WILL BE FOLLOWING THE THOUSANDS OF PRECEDENTS IN LONG-SURVIVING ANIMAL POPULATIONS.

THERE WILL BE A FINE HERITAGE OF INSTITUTIONS AND CUSTOMS THAT COST RELATIVELY LITTLE TO KEEP IN DILUTED FUNCTION, EVEN THOUGH THEIR OVERLY SPACIOUS BUILDINGS MAY HAVE TO RECEIVE A LOWER LEVEL OF MAINTENANCE. THE LESSER ERA MAY HOLD A BETTER ORGANIZATION THAN EUROPE'S MIDDLE AGES DID IN RELATION TO ROME. AS LONG AS THE ENERGY RATIO TO THE INDIVIDUAL IS HIGH, THE STANDARD OF LIVING NEED NOT BE LOW, AND THE AIR AND WATERS WILL BE BEAUTIFUL AGAIN. IF THE RECESSION IS CARRIED

CUT SLOWLY, WITH THE CRITICAL ASPECTS CONTROLLED BY PLAN, THE WORLD MIGHT WELL BE BETTER OFF AND LIFE QUITE LIVABLE. THE FIELD THAT IS NOW CALLED HISTORY WILL THRIVE IN A NEW RENAISSANCE, PROVIDING GUIDING PLANS, AS NEARLY FORGOTTEN MECHANISMS OF LOWER-ENERGY SOCIETIES ARE RETURNED TO FUNCTION AFTER CENTURIES OF DISUSE AND RELEGATION TO MUSEUMS AND REMOTE CULTURAL BYWAYS.

A BRIGHT POSSIBILITY IS ECOLOGICAL ENGINEERING. ADEQUATE KNOWLEDGE ABOUT THE NATURAL SOLAR-ENERGY-BASED SYSTEM MAY ALLOW A SMALL CONCENTRATED LOOPBACK OF ENERGY TO GUIDE THE SYSTEMS OF FIELDS, FORESTS, AND SEAS TO STABILIZE AND PRODUCE FOR MAN (SEE FIG. 1). WHILE THERE IS YET EXCESS ENERGY, IT MIGHT BE BETTER TO PUT CRASH EFFORTS INTO ECOLOGICAL ENGINEERING RATHER THAN INTO SPACE. A KNOWLEDGE OF NATURAL SYSTEM CONTROL WILL BE OF VASTLY GREATER SURVIVAL VALUE TO MAN THAN A MEMORY OF SPACE EXPLORATION. ONLY A SMALL PERCENTAGE OF ENERGIES TAKEN FROM NATURAL SYSTEMS NEED BE PUT BACK AT THEIR UPSTREAM GATE CONTROL CIRCUITS TO DIRECT THEM TOWARD THE UNIT CHOSEN TO RECEIVE THE YIELD.

WE DO NOT KNOW WHAT ROLE DIVERSITY SHOULD TAKE IN THE STABILITY OF SYSTEMS WHERE YIELDS ARE NEEDED. PERHAPS A SWEDISH PATTERN WILL PREVAIL IN WHICH THERE IS A DIVERSITY OF YIELD SYSTEMS IN SMALL ALTERNATING PATCHES, EACH ONE BEING UNIFORM. FOR EXAMPLE, THERE ARE SPRUCE PLANTINGS FOR PAPER, INTENSIFIED AGRICULTURAL PONDS, AND URBAN ZONES. SOME NATURAL MARINE SEA BOTTOMS ALSO HAVE DIVERSITY IN PLOTS, EACH OF WHICH IS UNIFORM WITHIN.

THE SOCIAL SYSTEM MUST ALSO BE PREPARED. LOW-ENERGY STATES WILL MAKE WAR LESS TERRIBLE THAN NOW, AND IF KNOWLEDGE OF THE WAYS TO ORGANIZE AGAINST COMPETITIVE EXCLUSION TENDENCIES CAN BE DEVELOPED WHILE WE STILL HAVE EXCESS ENERGY, WARS MAY BE ELIMINATED. AS WITH ECOLOGICAL PLANNING THERE IS THE SAME NEED TO USE AVAILABLE EXCESS ENERGIES TO PLAN FOR FUTURE SYSTEM CONTROL OF A LOW-ENERGY NETWORK OF MAN. LOOPBACK FLOWS OF RELATIVELY SMALL ENERGIES MAY BE

ABLE TO HOLD WORLD ORGANIZATION. IF RELIGIOUS SYSTEMS CAN DEVELOP A NETWORK-FAVORING ETHIC AS A SWITCHING SYSTEM TO HOLD INDIVIDUALS IN SUPPORT OF WORLD ORDER, THE MANIFOLD ORGANIZATION SET UP AT HIGH-ENERGY LEVELS MAY BE MAINTAINED AT LATER LOW-ENERGY LEVELS. GREATER WORK EXPENDITURE IS REQUIRED TO CREATE NOVEL STRUCTURE THAN TO MAINTAIN IT. THE PREPARATIONS NEED TO BE MADE NOW FOR THE CONTINGENCY OF RECEDED POWER.

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THE NEW PROPHECY

THESE THREE CONTINGENCIES MUST PRACTICE THE SAME ENERGY ECONOMY IN ADAPTING INDIVIDUALS TO THE NEW IDEALS BASED ON NEW SYSTEMS OF MAN. WHILE THERE IS ENERGY, WE NEED TO STIMULATE RELIGIOUS EVOLUTION.

WE MAY ENCOURAGE FASTER RELIGIOUS CHANGE EVEN NOW BY INJECTING LARGE DOSES OF SYSTEMS SCIENCE INTO THE TRAINING OF RELIGIOUS LEADERS. WHAT A GLORIOUS FLOOD OF NEW REVELATION OF TRUTH GOD (THE ESSENCE OF NETWORK) HAS HANDED MAN IN THE TWENTIETH CENTURY THROUGH SCIENCES AND OTHER CREATIVE ENDEAVORS. HOW FALSE ARE THE PROPHETS WHO REFUSE EVEN TO READ ABOUT THEM AND INTERPRET THE MESSAGE TO THE FLOCK. WHY DO SOME INHABITANTS OF CHURCH PULPITS FIGHT THE NEW REVELATIONS SIMPLY BECAUSE THE TEMPORARY PROPHETS ARE A MILLION SPIRITUALLY HUMBLE LITTLE PEOPLE IN LABORATORIES AND LIBRARIES, ONLY VAGUELY AWARE OF THEIR ROLE? WHY NOT OPEN THE CHURCH DOORS TO THE NEW RELIGION AND USE THE PREADAPTED CATHEDRALS AND BEST ETHICS OF THE OLD TO INCLUDE THE NEW? LET US INJECT SYSTEMS SCIENCE IN OVERDOSES INTO THE SEMINARIES AND SEE WHAT HAPPENS. WHY SHOULD WE FEAR THAT DEVIATION FROM THE RIGID SYMBOLS OF THE OLD RELIGION IS DEVIATION FROM MORALITY? A NEW AND MORE POWERFUL MORALITY MAY EMERGE THROUGH THE DEDICATION OF THE MILLIONS OF MEN WHO HAVE FAITH IN THE NEW NETWORKS AND ENDEAVOR ZEALOUSLY FOR THEM. PROPHET, WHERE ART THOU?