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SYNOPSIS OF HAMAKER THESIS ON THE SOIL NUTRITION THEORY OF GLACIAL CYCLES INVOLVING ATMOSPHERIC CARBON DIOXIDE AS A SIGNAL IN THE PRESENT 2.5 MILLION YEAR ICE EPOCH(*).

A Reprint of Reports from the
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Source material from John Hamaker, Don Weaver, Charles Francois, and Fred Bernard Wood (Fred B. Wood Sr.) with editorial assistance from Alden Bryant and Kathleen Clement and graphic assistance from Barbara Logan.

Basic Texts: John D. Hamaker and Donad A. Weaver, The Survival of Civilization, Hamaker-Weaver Publishers, Box 1961, Burlingame, CA 94010 (1982). Supplementary Bibliography (1983) and Solar Age or Ice Age? Bulletin irregular issues since 1983, same address as above.

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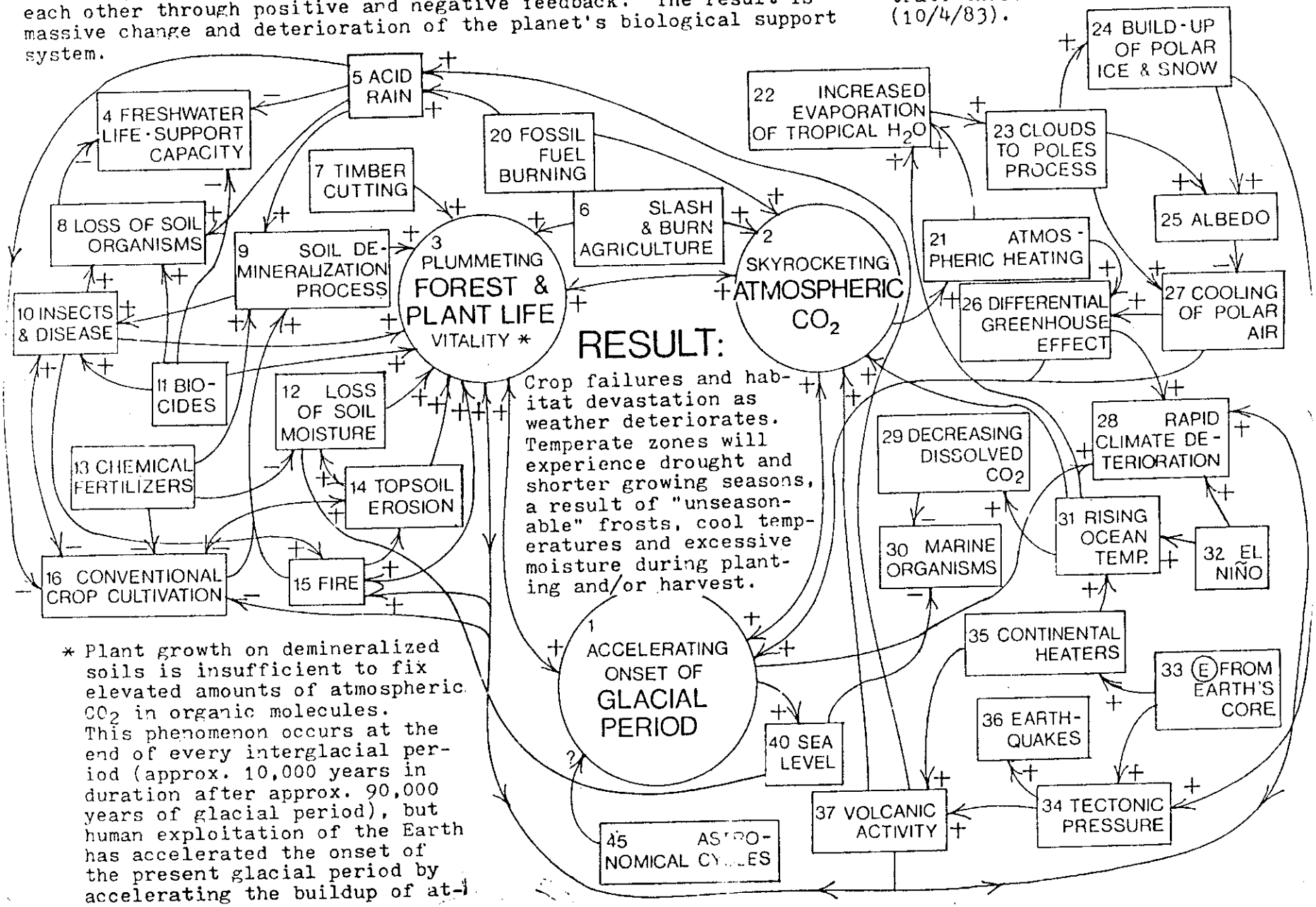
* "Ice Epoch" as defined by Windsor Chorlton and the Editors of Time-Life Books, Planet Earth: ICE AGES Alexandria, VA: Time-Life Books (1983), pages 21-22.

NOTE: CSIRI File A-1011 is handwritten annotated copy of The Survival of Civilization for use in preparation of an Index.
File A-1068-M relates to National Program of ISSS.
File A-1068-X relates to San Francisco Chapter of ISSS.
ISSS = International Society for the Systems Sciences, formerly International Society for General Systems Research (ISGSR, formerly SGSR).

ECOLOGICAL DIAGRAM OF CURRENT CONDITIONS

This diagram shows how categories of Earth systems presently affect each other through positive and negative feedback. The result is massive change and deterioration of the planet's biological support system.

Based on work of Charles Francois and Fred Bernard Wood to illustrate theories of John D. Hamaker (10/4/83).



* Plant growth on demineralized soils is insufficient to fix elevated amounts of atmospheric CO_2 in organic molecules. This phenomenon occurs at the end of every interglacial period (approx. 10,000 years in duration after approx. 90,000 years of glacial period), but human exploitation of the Earth has accelerated the onset of the present glacial period by accelerating the buildup of atmospheric CO_2.

The above ECOLOGICAL DIAGRAM OF CUPRENT CONDITIONS (Fig. 1) was derived from an expansion of a diagram developed by Dr. Charles Francois of Buenos Aires, Argentina, to explain the work of John Hamaker. (John D. Hamaker and Donald A. Weaver, The Survival of Civilization. Burlingame, Ca. (1982) 218 pp.) Hamaker's theory is that the rising amount of atmospheric carbon dioxide has caused extreme weather changes and is accelerating the coming of the next glacial period on our planet. Descriptions of elements in the complex multiple feedback cybernetic system that progress to glaciation are explained in the following text. (Overall planetary cooling which started about 1940 can be seen in data in the following papers: M.I. Budyko, "The effect of solar radiation variations on the climate of the Earth," Tellus, XXI (1969), 5, pp. 611-619, Fig. 1; Data extended by Borzenkova, et al, "Izmenenie temperatury vozduha sevrnogo polushariya za period 1881-1975," Meteorologiya i Gidrologiya, No. 7, 27-35 (1976); Data extended by Vinnikov, et al, "New interpretations of Northern Hemisphere Annual Temperature Anomalies, 1881-1978," Soviet Meteorology and Hydrology, 6 (1980), 1-10.

The ECOLOGICAL DIAGRAM OF CURRENT CONDITIONS illustrates what is happening in the biosphere of planet Earth. The SOLAR AGE DIAGRAM (Fig. 2.) following these notes illustrates what can be done by humankind to cooperate with "Gaia" (Earth as living organism) to restore an ecological balance to delay or prevent Earth's return to glacial conditions.

*****NOTE: These diagrams are not in compatible form for direct translation into computer simulation programs.

The principal factors affecting the ecological balance of Earth's biosphere are shown as numbered circles and rectangles labelled with abbreviated descriptions. (See following text for explanation.) At this stage of analysis, no attempt is made to put numerical values on the connecting arrows. Fig. 1 attempts to include all major feedback mechanisms. (Naturally we will appreciate the reader's mentioning any feedback mechanisms which may have been omitted.) An arrow with a plus(+) sign indicates the source factor for that arrow increases the factor being pointed to. Similarly a minus sign(-) indicates the source factor decreases the destination factor. Double pointed arrows indicate bidirectional feedback.

To make optimum decisions with incomplete data, we need to understand the testing of hypotheses in science as described by Dr. W. K. H. Panofsky in the book, Classical Electricity and Magnetism*, Reading, Mass: Addison-Wesley (2nd ed., 1962).

We used publications of the Society for General Systems Research and the American Society for Cybernetics to see how scientists look at complex systems. (General Systems (Yearbook)*, Vol. I (1956) - Vol. XXV (1980) and later issues. Procedings of the Annual Meeting of the Society for Genereal Systems Research*, irregular and incomplete coverage, different publishers in different years, listed only as book

in some years.

See the paper by Melvin Calvin, "The Path of Carbon in Photosynthesis," Science, Vol. 135 (March 16, 1962), pp. 879-889, for his explanation of photosynthesis and for examples of complex systems in nature.

We have studied "The Carbon Dioxide Research Plan, A Summary, April 1983," 34 pages, prepared by Frederick A. Koomanoff, Carbon Dioxide Research Division, Office of Basic Energy Sciences, Department of Energy, Washington, D.C. 20545. This research plan is a sound basic approach to study of the problems, but its time schedule is inadequate, and its consideration of feedback mechanisms insufficient. The rise in atmospheric carbon dioxide could easily reach a level beyond which humankind could effect a change by the time the U. S. Department of Energy completes its research. (As an indication of the importance of rising CO/2 levels, consider that Max Singer of Potomac, Inc., Arlington, VA, described the phenomenon as "genuinely civilization threatening." He spoke at the Global Tomorrow Coalition Conference, Washington, D.C., June ,1983.)

As we studied weather and climate systems, we realized that much of the published work on atmospheric carbon dioxide has been oversimplified, and that important factors and feedback loops have been overlooked. A discussion of the possibility that a number of positive feedback relationships are not reflected in most published forecasts of the effect of rising atmospheric CO/2 can be found in O. W. Markley and Thomas J. Hurley III, "A Brief Technology Assessment of the Carbon Dioxide Effect i," Technological Forecasting and Social Change 23, 185-202(1983).

Given the extreme deterioration of weather and necessity for long term food production, we need a crash program to quickly analyse these problems and institute corrective action speedily, such as the program conducted by the M.I.T Padiation Laboratory between 1940 and 1945, to develop the RADAR systems needed to outmaneuver the Nazis.

EXPANDED DESCRIPTIONS OF CIRCLE DIAGRAM CATEGORIES:

(1) ACCELERATION OF GLACIAL PERIOD ONSET marks the beginning of a 90,000 year build-up of glaciers. Various researchers have concluded that the initial stages of glaciation happen quickly, in perhaps as little as 20 years. Pollen studies of lakebed deposits show this (Genevieve Woillard, "Grand Pile Peat Bog: A Continuous Pollen Record for the Last 140,000 Years," Quaat. Res. 9, 1-21 (1978); "Abrupt end of the last interglacial s.s. in north-east France," Nature, Oct. 19, 1979.).

(2) SKYROCKETING ATMOSPHERIC CARBON DIOXIDE is the result of fossil fuel burning, aggravated by deforestation, slash and burn agriculture, diminished fixing of carbon by trees and plants on demineralized soils, decline of carbon in soils (diminished soil organisms, humus and plant material), warming oceans, and volcanic activity.

(3) PLUMMETING FOREST AND PLANT LIFE VITALITY is occurrig due to a

combination of soil demineralization and acidification with accompanying infestations of insects and disease. There is also a decline in area covered by forests and vegetation because of lumber cutting, primitive and mechanized slash and burn agriculture, topsoil erosion, desertification, conventional crop cultivation, fires, shortened growing seasons, drought, and "unseasonable" weather extremes (experienced during early stages of glacial period).

(4) FRESHWATER LIFE-SUPPORT CAPACITY is reduced or destroyed by ecosystem demineralization plus acid precipitation, and the long term use of biocides. Tens of thousands of dead and dying lakes in North America and Europe are now documented.

(5) ACID RAIN, caused by increasing fossil fuel burning, forest fires, and volcanism, falling on already fragile acidified soils, is hastening the dying of vast areas of forest worldwide. Lowering pH of acid soils further strips them of many essential minerals including calcium and magnesium. As pH drops further, aluminum is mobilized. Toxic aluminum compounds damage root hairs and the cells of the root endodermis, interfering with water and nutrient uptake. Trees deprived of nutrients and water, their root systems crippled, tend to quickly die. (John R. Luoma, "Dead Forests and Acid Bananas," Audubon, Vol. 85, No. 5 (September, 1983) pp. 38-41.) Acid rain also removes minerals and changes the mineral balance in agricultural soil. (See also Ulrich, "March Winds: They Bring with Them Acid Rain, Which I Can Monitor but Would Rather Change," Science 83, March 1983. Ulrich states that pH of 4.2 is the critical aluminum-unleashing level.)

(6) SLASH & BURN AGRICULTURE both hand methods and mechanized type used in tropical regions such as the Amazon River Basin and in Central America, have a compound effect which both reduces the forests and directly increases the atmospheric CO/2.

(7) TIMBER CUTTING without adequate reforestation contributes to the impoverishment of soil, decline of soil organisms, and erosion, which result in lowered vitality of subsequent plant growth.

(8) LOSS OF SOIL ORGANISMS (hence soil fertility) is caused by a number of factors; primarily soil demineralization, plus acid rain, topsoil erosion and present worldwide "soil mining" agriculture and forestry practices employing chemical fertilizers, biocides, and crop nutrient export systems neglecting recycling ("the law of return").

(9) SOIL DEMINERALIZATION PROCESS becomes more pronounced near the end of inter-glacial periods which have averaged a comparatively brief 10,000 years during our present 3 million year-old Quaternary Period. We are presently in the transition phase between interglacial and glacial conditions. This transition phase may last only a few decades. Reduced plant vitality removes less CO/2 from the atmosphere. Demineralization also leaves plants more susceptible to insect attack and destruction by fire, climatic extremes, and disease. During the 90,000 year glacial period, immense glaciers grind up Earth's rock crust and move the gravel and rock dust out over the continents. Glacial meltwaters create rivers which carry gravel, sand, silt and

dust which remineralize much of the land masses. Wind blown dust remineralizes broader and more distant areas. This glacial period of land remineralization supplies the soil with minerals which last approximately 10,000 years.

(10) INSECTS and DISEASE attack plants more readily when their soil has insufficient minerals. Insects and disease are more likely to become prevalent after long term use of biocides which reduce the productivity of conventional agriculture. Diseased and insect infested forests are more likely to burn, because of an increase in the number of dead and dying trees.

(11) BIOCIDES: Long term use of pesticides and herbicides reduce soil organisms in number and diversity and disrupt the natural balance of soil minerals, making plants more susceptible to disease and insect attack, and generally reducing vitality of soils and plants (by depriving plants of their food: microorganisms.).

(12) SOIL MOISTURE must be within certain limits for optimum crop cultivation. Too little or too much can severely disrupt the growth cycle, and result in wind and water erosion of topsoil. Drought-stressed plants become highly susceptible to fire.

(13) CHEMICAL FERTILIZERS are known to increase yields in conventional crop cultivation to a short-term peak, after which ever increasing applications bring diminishing returns along with extensive soil degradation. Mineral depletion and wholesale erosion, combined with build-up of toxicity and depletion of soil organism/organic matter, inevitably leads to dangerous or disastrous decline in crop quality and quantity. Without complete replenishment of soil nutrients, fertility turns to sterility.

(14) TOPSOIL EROSION contributes to soil demineralizaton (as well as soil organism/organic matter depletion) thus reducing soil fertility and plant vitality.

(15) FIRE occurs more frequently as a result of rapid climatic deterioration and drought. (The decreasing vitality of soils and plants makes whole systems more susceptible to fire.)

(16) CONVENTIONAL CROP CULTIVATION contributes to the increase of CO/2 in the atmosphere: Use of NPK fertilizer disables the natural plant feeding processes by "mining" soil reserves and starving soil microorganisms.

(17)- (19) numbers reserved for additional feedback mechanisms.

(20) FOSSIL FUEL BURNING has a compound effect: first, it increases atmospheric CO/2, and second, its sulphur and nitrogen compounds worsen acid rain and soil conditions which accelerate the death of forests, eliminating primary natural absorbers of atmospheric CO/2.

(21) ATMOSPHERIC HEATING in the tropics and mid latitudes occurs as carbon dioxide, a gas transparent to the visible light from the sun,

but which blocks infra-red radiation, reduces the amount of infra-red radiation that the Earth re-radiates back to space. CO/2 and other gases such as methane and chlorofluorocarbons accentuate the greenhouse effect and are increasing via fossil fuel burning, biomass destruction (including termites and organism oxidation), volcanism, and human pollution.

(22) INCREASED EVAPOPATION OF TROPICAL WATEP is caused by elevated atmospheric heat. Increasing water vapor produces more clouds which are carried toward polar regions in the natural exchange with cold polar air masses.

(23) CLOUDS TO POLES PROCESS is accentuated by the differential greenhouse effect. Seasonal wind patterns are speeded up because of the increasing temperature differential between tropical air and polar air. Thus more clouds are carried from the tropics to the polar regions.

(24) BUILDUP OF POLAR ICE & SNOW is thus accelerated by the increasingly heavy cloud cover coming from the tropics. As the clouds near the poles, they cool and drop more snow which increases the area of snow cover and thickness of glaciers. The increased cloud and snow cover increases the albedo which increases the amount of solar energy that is relected back into space, thus reducing snow melt and cooling these regions and beyond. This process gradually causes a vast expansion of glaciers so that a large part of the Earth is under ice for approximately 90,000 years.

(25) ALBEDO is increased as clouds move to the poles and reflect more solar energy back to space, by the larger area of snow and ice cover on the ground, and by soil degradation, desertification, devegetation, and deforestation. Increased albedo contributes to Earth's overall cooling and return to glacial eco-climatic conditions.

(26) DIFFERENTIAL GREENHOUSE EFFECT occurs as carbon dioxide blocks the re-radiation of infra-red wave lengths, causing more heating in tropics. Colder, high-pressure polar air plunges toward the equator while hot, cloud-containing, low-pressure tropical air rises and moves poleward.

(27) COOLING OF POLAR AIR occurs as increased cloud cover in upper latitudes increases albedo and reflects more solar energy away from Earth, accentuating temperature diffferential.

(28) RAPID CLIMATIC DETERIORATION occurs, especially at the beginning of a "normal" glacial period and before the glacial expansion is markedly observable. Rainfall patterns are changed in amount and distribution. Storms and winds become increasingly violent because of the increased temperature differential between warm and cold air masses. (There has been a large increase in the number of tornadoes reported in the World Almanac:

1925: 130 tornadoes	1955: 593 tornadoes
1935: 180	1965: 899
1945: 121	1974: 945)

(29) DECREASING DISSOLVED OCEAN CO/2: Cold oceans hold more CO/2 than do warm oceans. It should be noted that oceans change temperature more slowly than land masses. Calcium carbonates are found in ocean depths. Further work is needed to evaluate the net effect of ocean warming (Low-latitude ocean CO/2 "boil-off") versus cooling (high-latitude ocean CO/2 sink capacity).

(30) MARINE ORGANISMS: Atmospheric CO/2 is utilized by phytoplankton and concentrated into calcium carbonate by the rest of the marine food chain. Zooplankton, especially Foraminifera, create calcareous exoskeletons and oozes. When minerals are abundant as at river mouths, along ocean upwellings and in the vicinity of sea-floor volcanoes, marine organism populations flourish. Depending on pressure and temperature of ocean water a phenomenon occurs called the calcium compensation depth. Below the CCD calcium carbonate dissolves and becomes carbonic acid and bicarbonates. The ocean holds more carbon than do land masses.

(31) RISING OCEAN TEMPERATURE occurs at temperate and equatorial regions because of CO/2 induced greenhouse warming. (see Hamaker, ch. 6)

(32) "EL NINO" is a cyclical phenomenon of unusually warm Pacific Ocean water in parts of the ocean, possibly heated by continental heaters on the ocean floor. (See # 35 below.) El Nino may also result from extreme atmospheric heating, but the large temperature increase indicates additional factors may be working.

(33) & (35) ENERGY FROM EARTH'S CORE and CONTINENTAL HEATERS: Earth's second source of energy in addition to that from the sun is energy from the planet's interior. The layers of the Earth from core to crust are as follows:

1. Solid inner core
2. Molten outer core
3. Semi-solid mantle
4. Moho (gunk)
5. Crust

Gravity separation concentrates molten radioactive materials, sometimes resulting in accumulation of a critical mass, a source of atomic fission energy. Fissionable masses occur in the Moho ("gunk") layer and are called continental heaters. Their extreme heat generates enough energy to melt and push up magma which builds continents, raising mountains and plateaus above sea level. The heaters connect through openings with the molten outer core. (See Chapter 6 of The Survival of Civilization for explanation of how the tectonic system works.)

(34) TECTONIC PRESSURES: (Earth's rotation) The weight of the glaciers and varying thickness of the crust exert variable pressure on the tectonic plates of Earth's crust. Differentials between weight above

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and extreme heat below the crust allow the crust to float hydraulically on the viscous Moho ("gunk"). (Hamaker, Chapter 6.) Ocean floors are formed by heaters below mid-ocean ridges. Pressure from below forces ocean floor movement away from the ridge crack, feeding floor toward a continent where it is forced below the continental mass. Mineral release occurs along ocean heater cracks enhancing phytoplankton growth. (Short term emission of poisonous gases may kill phytoplankton, temporarily disrupting the food chain and causing fish to move elsewhere.)

(35) CONTINENTAL HEATERS (ACTION): See (33).

(36) EARTHQUAKES occur more frequently as tectonic pressures are increased by weight of increased glaciation.

(37) VOLCANIC ACTIVITY increases during time of global cooling. Volcanoes emit acidic gases and large amounts of CO/2. These adding to forest and soil destruction and excacerbate climate deterioraton. The volcanic ash suspended in the air can block solar enengy causing less melting of the snow in the polar regions, and further high-latitude cooling. Volcanic activity at middle and equatorial latitudes distributes minerals over land (and sea) again.

(38-39) numbers reserved for future additions.

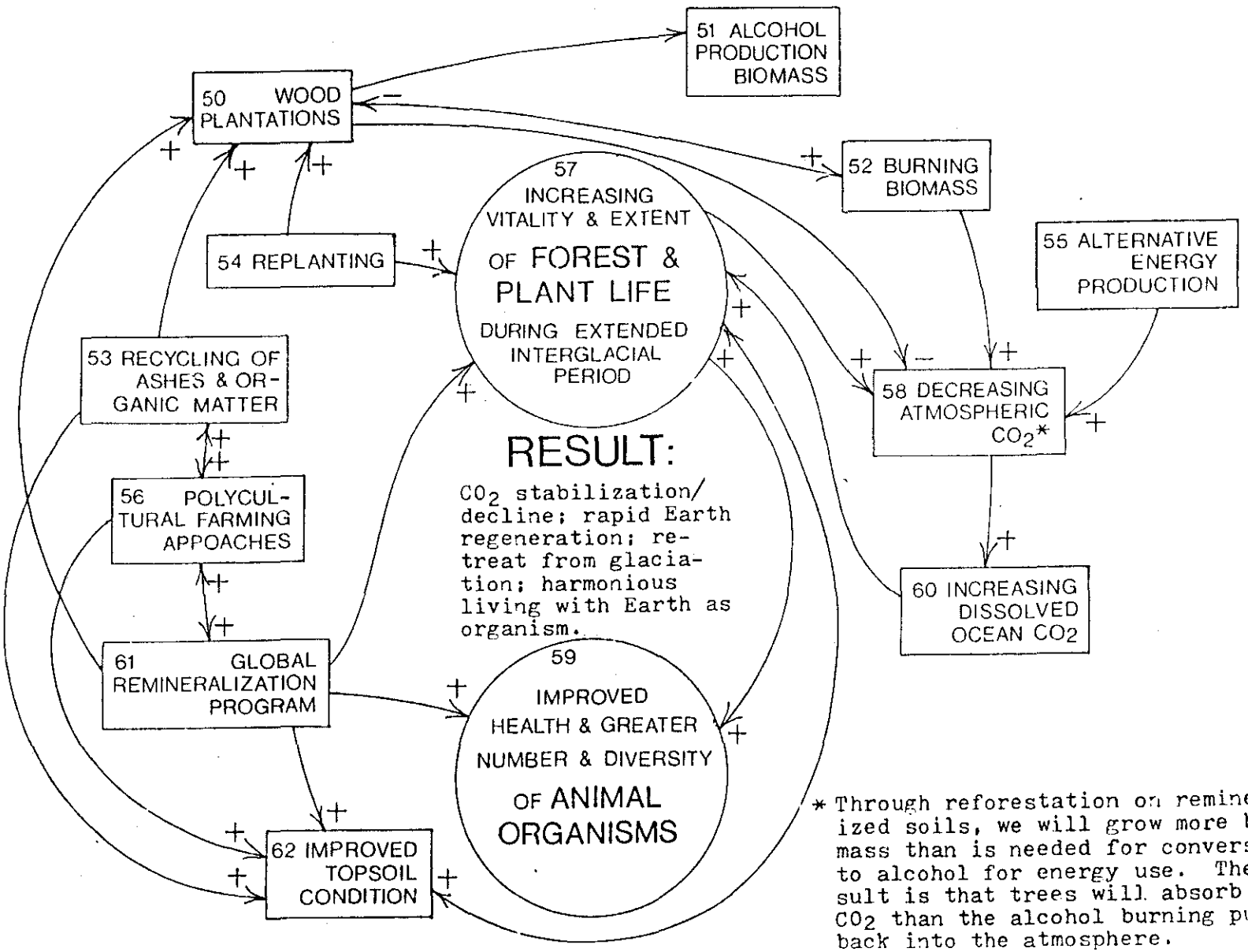
(40) SEA LEVEL fluctuates according to buildup of glacial ice. (Ice accumulation decreases sea level, but increased weight of ice forces ocean floors to rise, increaseing sea level.)

(45) ASTRONOMICAL CYCLES: Some of the sub cycles of astronomical cycles line up with the lesser variations in the amount of ice in the polar ice caps. A timing correlation of glacial build-up with the Milankovitch cycles of variation in the Earth's orbit is insufficient evidence that glacial periods are primarily triggered by astronomical cycles. Some scientists believe that the correlation between the glaciation cycles and Milankovitch cycles of changes in the Earth's orbit indicates that the orbit changes cause the glaciation. John Hamaker has made calculations of the dynamics of Earth's orbit under changing moments of inertia due to changing amounts of ice at the poles. Possibly glacial cycles could be the cause of the orbit change. (Evidence exists that approximately 450 million years ago a sudden magnetic pole relocation occurred. There are warm water calcium fossils directly on top of glacial deposits in Africa.)

ECOLOGICAL DIAGRAM OF THE SOLAR AGE

Factors featured in "current conditions" diagram which are not included below will have become negligible and/or have stabilized.

Based on work of Charles Francois and Fred Bernard Wood to illustrate the theories of John D. Hamaker. (10/4/83)



* Through reforestation on remineralized soils, we will grow more biomass than is needed for conversion to alcohol for energy use. The result is that trees will absorb more CO_2 than the alcohol burning puts back into the atmosphere.

ECOLOGICAL DIAGRAM OF THE SOLAR AGE

(50) WOOD PLANTATIONS need to be established to grow trees both to remove CO/2 from the atmosphere and to serve as our major energy source. Burning of fossil fuels adds CO/2 to the atmoshere. Growing many more trees than are needed in a program of systematic replanting will result in a net decline of atomospheric CO/2.

(51) ALCOHOL FERMENTATION by "... small local alcohol and methane power plants ..." will minimize "the very heavy cost and energy requirements for transportation of energy supplies...." (Pamaker, The Survival of Civilization, p. 104).

(52) BURNING BIOMASS such as plantation grown trees should be substituted for burning of fossil fuels. For general energy production, plantation tree output can be converted to alcohol for continuous flame systems like steam engines. Well-engineered power plants could be designed to burn wood directly. The reason solar energy "hardware" systems are not being advocated in the near future is that in the starting phase the production of solar energy systems would add more CO/2 to the atmosphere and would not remove it, as trees would. All forms of ecologically beneficial energy conversion, including boiling fluid solar and photovoltaic solar, may be encouraged after CO/2 levels are restored to interglacial levels. Tree-plantation solar energy is the only form which can simultaneously provide energy, replace fossilized-carbon fuels, and create a net withdrawal of carbon from the atmosphere - as the carbon fixed in roots, small branches, and leaves goes into the soil.

(53) RECYCLING OF ASHES AND ORGANIC MATTER along with periodic remineralizaton will help the wood plantations grow fast, improve topsoil condition, and create a high level of nutrient cycling.

(54) REPLANTING trees on deforested areas that are also remineralized will regenerate whole ecosystems,and will create ripple effects reversing trends toward desertification.

(55) ALTERNATIVE ENERGY PRODUCTION using such devices as photovoltaic cells, wind turbines, etc. may be encouraged in areas where is is not feasible to grow biomass.

(56) POLYCULTURAL FARMING of diversified and rotating crops, including perennial and tree/orchard crops supplemented by remineralization and recycling of ashes and organic matter can help maintain the topsoil in good condition.

(57) INCREASING VITALITY AND EXTENT OF FOREST AND PLANT LIFE DURING EXTENDED INTERGLACIAL PERIOD is promoted and maintained by remineralization, replanting of plantations and forests and stable weather conditions from reduction of the CO/2 in the atmosphere.

(58) DECREASING ATMOSPHERIC CO/2 will be accomplished by growing more trees (on wood plantations, in orchards, etc., as well as in natural

forests), than are burned or fermented for energy.

(59) IMPROVED HEALTH AND GREATER NUMBER AND DIVERSITY OF ANIMAL ORGANISMS will be the result of increasing quality and quantity of plant life.

(60) INCREASING DISSOLVED OCEAN CO/2 will occur as atmospheric CO/2 declines and oceans cool.

(61) GLOBAL REMINERALIZATION PROGRAM: The primary thing that humans can do to regenerate the soil and Earth-biosphere and to decrease atmospheric CO/2 is to remineralize soil. Grinding a variety of mixed rocks (and glacial deposits are usually adequately mixed) to a fine flour to add to soils will result in much improved plant growth wherever moisture and sunlight are adequate. (Experience of Arthur Carter Savage in his gardens in Nicholasville, Kentucky, showed that abundant soil minerals gave vegetables and trees high resistance to cold.) (Hamaker, chapter 5, many references.)

(62) IMPROVED TOPSOIL CONDITION will nourish microorganisms, the first link in the protoplasm/food chain. (Hamaker, pp. 24-28.) Accomplished through remineralization combined with ecological cultural practices, soils can be improved to enable plants to withstand "unseasonable" conditions.

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