

1984 Cereal Chemistry Seminar
— The Commercial Value of Live Grain —

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The Biological Utilization of Physical Energy

1. Connections

Rodney Dangerfield has asked perhaps the most critical question of the day, “Why ain’t I got no respect?” The white-hot political issue is respect for life—the moral dilemma of individual right to life, of the common right of all life and of unborn future life. The moral dimensions of human overcrowding, of ecological poisoning, of depletion of resources, waste of interdependent life, of war, of pestilence and hunger, are not seen as right-to-life issues. An even more basic question, what social bias has caused the cultural ingraining of a public attitude that causes these abuses, needs answering.

Science and religion are in quest of consciousness of relationships that reveal and compel to right order, to the common good. Universal religion is consciousness of relationships in the universe, and the discipline of this awareness on personal conduct. Science and religion are the same in their common objective, truth. Disrespect for truth, whether by science or religion causes disrespect for life and for person.

The path from chaos to consciousness in the universe is a history of relationships, of the interaction and unfolding of energy/ matter, physically and biologically. Consideration of this is of practical and academic purpose. The path of conscious chaos is a human defect.

A workable definition of intelligence is “consciousness of purpose”. A workable definition of morality is “conscious conformity to universal purpose”. There is no morality in ignorance (!), which states the moral imperative compelling every individual to inform personal intelligence. The imperative of personal morality is an imperative of science. Science (knowledge) is the conscience of religion. When speculative knowledge takes liberties with truth, science proves or disproves with evidence. Religious speculation in incompletely understood relationships is at risk of erring and of being exposed. The existing body of collective science is so vast that laws compelling to universal religion should be obvious.

God’s law of universal relationships in life is indelibly written in water. Divine sensitivity is in the transparency of water. The providence of life (food-energy) is in the working of water, which rearranges matter in the ascent of life on its spiral staircase, DNA. This incredible structure is the operative mechanism of life, and is its library. Significant adjustments in the history of life’s unfolding are recorded there, and memory machinery imprint experiences for future use. DNA is the computer chip by which Worthy Purpose (sacra mens) functions “by nature” and “by nurture” to adapt life to physical and cultural circumstances along its way. Poisoning ecology, wasting life and depleting resources are violations of the Worthy Purpose of nature and are unethical acts. If religion is authentic it must speak out against these sins as strongly as it does against abortion.

In the debate of vital issues, too much energy is expended in producing too much heat and too little light. Pointless expenditure of energy causes entropy. Violation of sacrament produces entropy. De-molecularizing and de-atomizing matter return it to uselessness for life. The Worthy Purpose of life is accomplished in molecularizing, in the controlled entrapment and utilization of energy in matter. Sacrament is both the motive [objective] and motivation of life. Sacrament of food (eucharist) comes from sacrament of water. In the cycles of life energy is purposely engaged in the furtherance of sacrament, that is, in the advancing of life in matter. Life is itself the expression of energy in highly organized matter, whether, the human body molecule, or whether the less grand grass seed.

When least life is wasted, all life is diminished. Disrespect for life is so prevalent because a consciousness of connections is missing. Humans fail to see the

connectedness of matter and energy in their common affairs of daily life, of agriculture, of science, of religion, of education, of politics, of business, of economics. All of these contribute to the seamless mantle of life enveloping earth, and because of human insensitivity, all life is threatened with catastrophe.

Defining terms. [The words] Heat and energy are commonly interchanged. But, they are used incorrectly. The energy-state of seeds is decreased by exposure to heat. The application and expenditure of energy are evidenced by heat. Heat is the "feel" of an object, a measurable condition of molecular friction, that is, [of] the speeding up or the slowing down of electron rotation. It is a form of communication. Temperature is the language communicating the message of radiating heat. Energy is potential for work. It is built up in matter by converting heat radiation to chemical energy. The common source of radiant heat is the sun which floods earth with biologically useful waves in the infrared and visible light spectra.

2. Atom to Adam

A systematized understanding of physical order in the universe surely is in understanding operative laws in the organization of subatomic particles into inductive/repulsive machines, atoms and molecules, electric motors.

It is presumed that the formation of all matter operative in the universe is from the accommodation of forces of attraction/repulsion associated with subatomic particles and their bonding under energy equilibrium of centripetal and centrifugal forces. Protons constitute the nucleus of atoms and have a positive, centripetal potential, while electrons, under the influence of, but outside the nucleus, offset the energy of the nucleus with an essentially equal but opposite (negative) centrifugal potential. Simplistically, this characterizes energized matter accessible for structuring in life.

Physical interaction of atoms occur by which electrons of one atom come to be shared with another atom, and, by which one atom will give up an electron and another will accept the electron. Presumably, pathways of this sharing and surrendering of electrons may involve even subatomic components of electrons. Subatomic particles, electrons and atoms involved in this giving and taking and having positive and negative charges are "ions". An atom that wants to accept an electron is positively charged (cation), and one that wants to give up an electron is negatively charged (an-ion). Light itself is a stream of particles called "photons" whose individual quantum of energy varies inversely with the wavelength. Photons are energy agents intercepted in chlorophyll and used in assembly of glucose (6)C-HOH, and are trapped by photosynthesis in the molecularizing of life. The action of photons in plastids (chlorophyll) is at the electron and/or subatomic level, and may be operative in visible and non-visible light spectra. Its contribution is presumably quantitative.

In view of the inductive/repulsive potential of centripetal and centrifugal energy in every atom and molecule, each is an engine in its own right with a potential for work. The assembly of these machines has been in the foundry of the cosmos over billions of years, and their unique construction is the handiwork of operative forces in space, gravitation, radiation, etc. They possess the ability of responding to solar radiation, for example, by having the dynamic equilibrium of subatomic constituents raised to more increased motion, and coming to a higher energy-state. This responsiveness is selective, that is, molecules (atom) of a particular character will respond to wavelengths in specific bands. For example, water and carbon dioxide are particularly responsive to specific wavelengths in the infrared band. The increased energy potential is from attenuation of harmonic (sympathetic) wave energy.

Laws governing energy and matter are highly predictable and reliable. It is this redundancy that puts matter and energy in relationship and which puts organized

structures in cyclical relationship. This reliable redundancy of nature is what secures faith in its providence. The determination of this redundancy is [natural] “purpose”. By virtue of its beneficial consequences, the containment of energy in atoms and molecules for purposeful work is “holy”. The word for “holy purpose” in religion’s language is sacrament. Sacrament is centripetal energy [syntropy]. The opposite of sacrament is entropy; by it, energy is let free to escape from molecularizing. Entropy is centrifugal energy. Wasting life is entropy. Destroying seed life is entropy. Denuding rainforests is entropy. Chemical agriculture is entropy. Farming marginal land is entropy. Spoiling water is entropy. Draining wetlands is entropy. Paving topsoil is entropy. Removing nuclear energy from atoms is entropy. All of these violate [natural] sacrament. Entropy destabilizes energy equilibrium accomplished by molecular arrangements of life, and hastens chilling of earth by disintegration of its [her] seamless mantle. Use of energy must be with conscience, as must care to replenish it for future generations.

The continuum of life, characterized by its obvious purpose in cyclical connect-edness in water, confirms the unity of life, the more so that DNA is substantively identical in all living cells. There is no biochemical activity in cells except with relation to water, which is both life’s medium and principle contributor. This awareness is deep-rooted in human consciousness and intimately associated with religion. It speaks not of human separation from the order of life, but to dependency within it. It speaks not of kingly privilege for humans, but of responsible stewardship and kinship. It speaks not of disparate creation of various life forms (creationism), but of evolution by symbiosis from common origins.

The bankruptcy of literal, creationist theology is evident in its legacy of ecological disaster. The postponement of entering into an enlightened new consciousness of living in symbiotic relationship, and of conscious respect for all life, can no longer be allowed. Religion must update its conscious base to include scientific knowledge of relationships, and science must preserve its ethical responsibility of being faithful to truth.

3. Seeds and Insights

The destiny of a live plant is wrapped up in the production of seeds, and the destiny of the seed, to produce a live plant. In this cyclical order, energy and matter come to be used over and over again. But more than that, subtle additions that escape perception happen. Increase [by the agency of water] is given to living matter.

The seamless mantle of life on earth, that is, ocean-life, the soil, all flora and fauna and atmosphere, is that significant addition, and the components of it, have their origin in the successful entrapment of photons coming from the sun. Photon energy is particular so that entrapment of it makes a substantive contribution to living earth.

Biochemical utilization of solar energy is at the electron and sub-electron level. Coming to knowledge of the mechanisms and processes involved is to come to greater understanding of the origin of life itself. The gaseous mixture of the atmosphere, minerals of earth and oceans of HOH are the organized substances used by life to steal sunshine and to raise its energy to consciousness in the human body molecule. Of this order all life is beneficiary, and the reciprocally responsible benefactor to it.

With humility and respect humans should seek greater insight into the order of nature, and use their insight to symbiotically facilitate its Worthy Purpose. Here is the cathedral for authentic worship. Sacrament is inescapably the moral obligation of science and religion because of conscionable self-reflectivity. From communication comes consciousness, and from consciousness, conscience.

Our purpose here is to increase our understanding of the commerce of life in seeds, and from this consciousness make symbiotic connections to real [everyday] life, also for greater personal respect for life. Einstein’s energy/matter equation deals directly

with the economy of energy on earth, substantive effects on matter, and specifically, with the physics of photo-electricity by which sunlight energy restores what is lost to entropy. The critical link is the seed. Without the seed there is no plant, no photo-electric reserve of food, and only limited life on earth.

Commercial Value: [The Water Factor]

1. Dead Grain vs. Live

Life is a continuum of successive processes, which provide for the growth and maintenance of organisms, and is a value worth preserving also in commercial grain. This scientific observation seems innocuous enough, but it has instigated much controversy and adversary response in the grain drying industry for HARVESTALL's commercial commitment to it.

Dr. Edward Deckard, Agronomist at North Dakota State University is quoted in a 1977 trade publication: "I know of no published data showing germination percentage to reflect nutritional quality of grain. (3). Relating to this view is that of H. S. McKee who believed an observation of Vasiliev in 1908 was still valid in 1949: "It is remarkable that up to the present time seed ripening has been so little studied, though the process is of the highest interest as we are here dealing essentially with the synthesis of organic substances". (1).

I believe the observations [of Vasiliev] are still true except for my work and the commercial commitment of HARVESTALL since 1960. If there are more recent findings, they have not influenced industry. The unpublished Master of Science Thesis of this writer, Effects of Drying Method on the Germination of Corn (4) addresses the relationship of germination to commercial value of grain. Steffen Patent 3,408,747 (November 5, 1968) specifies maintaining the environment of stored seeds so as to accomplish temperature/moisture equilibrium with atmospheric air, with low inputs of heat at most, and the use of levels of ventilation as determined by volume and wetness of grain so as to preserve intrinsic biological values, including seed-life. This pioneer process patent and others that have followed it are controlling in natural-air/low-temperature drying and atmospheric ventilation of [life-secured] grain.

Aggressive marketing under these low-temperature-drying patents since the mid-sixties has had widespread market impact, which continues to the present time. The presumption of HARVESTALL Marketing was that the authenticity of HARVESTALL science would be reinforced by user experience [and it has been], and that continuing research at land grant universities would document devaluation of grain from exposure to heat, and [that universities] would eventually verify and endorse the seed-science of HARVESTALL. Unexpectedly, agricultural engineers at land grant universities responded adversarially to HARVESTALL and engaged the Extension Service network in their public aggression. And with catastrophic damage to HARVESTALL, I might add.

HARVESTALL believes that its market effort is sounded in objective science [and] with consideration of the multiple sciences involved; that its teachings and their application are in the public interest and particularly, in farmers' interest. HARVESTALL welcomes good faith, critical scrutiny of its science and conduct.

This backgrounds the reason for my presence here today. I am personally indebted to Dr. Orville Banasik and Dr. Joel Dick, of the Cereal Chemistry Department, for the privilege of presenting my thesis.

Simply stated, the thesis of HARVESTALL is:
THE ELECTROLYTIC POTENTIAL OF LIVING SEEDS DIRECTLY DERIVES FROM ACTIVE EFFECTS OF SOLAR RADIATION IN THE VISIBLE LIGHT AND INFRARED SPECTRA, IN THE MEDIUM OF CELL WATER. THE INCREASED ELECTROLYTIC

POTENTIAL EXPERIENCED IN CHILLCURED CORN IS FROM GREATER ACTIVE SOLAR ENERGY INPUT DURING THE RIPENING PROCESS. THE BENEFICIAL EFFECT OF ACTIVE COLLECTION, USE AND STORAGE OF SOLAR ENERGY IS IN MAKING THE SEED A MORE USEABLE FOOD RESOURCE, BOTH QUANTITATIVELY AND QUALITATIVELY, WHICH IS ANALOGOUS TO CHARGING A BATTERY. THE FULL COMMERCIAL VALUE OF FOOD GRAIN POTENTIAL IS ACHIEVABLE IN **LIVING** GRAIN, NOT IN DEAD AND DAMAGED GRAIN, AND ONLY IN THE SUCCESSFUL COMPLETION OF RIPENING PROCESSES.

2. Photo-Electric After-Ripening

A commonly experienced frustration in cold weather is to step into one's car, turn on the ignition, get several painful groans, and then nothing. Dead battery. Unless seeds are allowed to charge their batteries, the embryo may experience something of the same frustration when it wants to grow. The best analogy I can think of to illustrate "after-ripening" in seeds is that of "charging the battery". Alternately, this ripening process is properly termed "natural CURING". A battery is charged when a maximum reserve of electron energy is stored in chemical form. The charging of the battery is accomplished by a specific mechanism and process that brings its [battery's] chemistry to an electron-rich state. In the automobile it is the alternator; in the seed (cells) it is the mitochondria and plastids.

All physiologically active cells typically have both mitochondria and plastids. The common fuel produced by them, and used to power all living processes of cells and living systems is ATP (adenosine tri-phosphate), as phosphate sugar derived from glucose, C-HOH. In the case of mitochondria, the production of ATP is by oxidative phosphorylation (as in the Krebs cycle), whereas, in the case of plastids it is anaerobic and by photo-phosphorylation, and powered by solar radiation whose energy is molecularly accessible by way of water and carbon dioxide. Photon energy is the operative energy.

To understand where and how biochemical processes work in seeds, a review of seed morphology is in order. The seed of *zea maize* is representative of grass seeds and convenient to our discussion.

The most obvious structures of the corn seed are the embryo (germ) and the endosperm. The embryo is a shield-shaped structure that is called by the Latin name scutellum. Mitochondria are present in the cells of the scutellum but not in endosperm. Plastids are more predominantly present in the cells of the endosperm. Germination and growth of the seed are powered by oxidative phosphorylation in germ cells. Upon hydration [seed uptake of water], gibberellins are produced by germ cells and cause aleurone-protein to be hydrolyzed. The aleurone is a structure of protein-packed cells wrapped like a skin around the endosperm, just under the seed coat. With germination, enzymes act on the endosperm starch to make it accessible food for the incipient plant.

Photolysis and phosphorolysis are presumably activated in water. Wetting of grain by soaking (hydration) and wetting by hygroscopic absorption of moisture from the air do not necessarily have the same effects. Absorption from atmospheric air temporarily causes weight reduction, presumably from increased rate of respiration, yet, the long-term effect may be of weight gain. In flour made from seeds, the nutritional utilization of food substances, minerals, etc., is presumably enhanced by photolysis, phosphorolysis and hydrolysis. The addition of yeast to dough produces carbon dioxide by fermentation and increases acidity, presumably with photophosphoro-hydrolytic responses, for example, making phosphorus, magnesium and calcium accessible from [seed] phytin.

In the formation of most seeds the endosperm is short-lived. Cereal grains and several other species differ characteristically in the transformation of the endosperm into a major organ of stored food. Typically, crystalline starch and protein are accumulated in plastids. Endosperm cells abound in plastids laced with crystals of modified starch. The characteristic yellow of the endosperm is of the plastids. Plastids are the material of chlorophyll and are made up of striated layers of grana, battery-plates, if you will, holding charges of electron energy.

Since seeds carry self-contained food supplies they must contain ATP and/or materials for its production. Original derivation of newly synthesized ATP is with materials of photosynthesis and occurs in chloroplast. Nearly one-third the structure of chlorophyll is composed of phytol, an alcohol that is highly reactant with oxygen. Phosphorus is an essential mineral intimately associated with plastids, but is typically present in seeds in a poorly accessible form, phytin. Phytin is a calcium magnesium salt of inositol phosphoric acid. It is known that availability of phosphorus improves in grain with storage.

With the onset of senescence, leaf and stem cells deplete themselves of food materials, even proteins, which must be hydrolyzed to amino acids before they can be translocated to the seeds; as this is taking place, waving fields of grain change from green to gold. A large proportion of phosphorus of mature plants ends up in seeds and is associated with plastids of the endosperm cells. Yellow pigmentation reveals carotenoid structures typically associated with chlorophyll in grana. In view of absence of mitochondria in the endosperm, the transformation of materials in the endosperm is presumably by the photo-responsive action associated with grana. Cell walls of the endosperm may degrade to facilitate biochemical response.

The production and accumulation of starch and protein in plastids are interactive, photosynthetic processes. Protein is simply modified starch, 85% C-HOH. The accumulation of starch and protein in cells is by way of phosphorylation, the Krebs cycle. Presumably, plastids continue to play a key role both in fueling enzyme-controlled processes and in storing accessible electron energy, ATP.

Protein of the aleurone consists of large molecules made up of many glycosidic linkages. Obviously, presence of protein in the aleurone is by way of being constructed there. It is likely that in the transformation of starch and protein in plastids of endosperm cells, transfer of amino acids from inner cells to outer cells provides material to structure the protein of the aleurone. This is presumably a significant process of after-ripening and one of commercial importance. Carbon dioxide and water are critical contributors. Removing water by artificial drying and denaturing protein with heat are gross catastrophes to the seed for [the] conclusive inhibition of after-ripening processes.

Maintaining an optimum condition for cells of the endosperm to promote photophosphorylation is by way of hygroscopic interaction with the atmosphere. In that protein formation is slow, particularly under cool temperatures of late season, it is important that a continually favorable environment be preserved throughout storage. This means holding seeds to optimum moisture and temperature. In practice this may best be accomplished with seasonal wet-bulb temperatures, which regulate both seed-temperature and seed-moisture. The interaction of temperature/moisture aptly defines both a "dormancy index" for grain, and conditions leading to chemical stability for seed food...

The particular responsiveness of water and carbon dioxide to infrared [radiation] by [the] attenuation of energy in specific wavelengths is believed operative in photophosphorylation here. Ventilation of grain with atmospheric air, and the use of infrared radiation [electrical heat lamps] to energize air-humidity may contribute to the photophosphorylation of ripening seeds in storage, to aleurone protein synthesis, to ATP

accumulation, to greater electron potential, to the fixing of hydrogen and oxygen in seed carbohydrates, etc.

What factual evidence exists to support the speculative mechanisms and processes suggested? There are data showing significantly increased rates of emergence in corn seeds after 18 months in storage as compared with rates of emergence after 6 months storage, 83% and 56%, respectively. (5). The modification of food reserves and the increased electrolytic potential over storage are postulated causes, namely, more abundant reserves of electron-energy, more accessible ATP, for example. There was no significant difference in germination percentages of corn stored below 18% moisture. Improved emergence was greater at higher moistures.

Data from blending dry corn (9.9% moisture) with wet corn (18.8% moisture) showed an inverse linear relationship with the gradual reduction of seed moisture to increased dry weight, both in originally dry grain and in originally wet grain. After 240 days a 3% increase of dry weight over original dry weight was obtained in the wet grain. (Published in Grain Ecology.) (5).

But by far the most convincing data are those of thousands of on-farm practitioners of the CHILLCURING science of HARVESTALL since 1970. These have been reported in investigative articles of trade publications, particularly those of the electrical power industry...[The] testimonial ad (Back to Good Grain) was the [adversarial] focus of the Minnesota Extension Service, Agronomy and Plant Genetics, "Crop News, No. 40", May 1978, *Weight Shrink and Dry Matter Change During Drying and Storing Corn Grain*, D.R. Hicks, H.A. Cloud, and L.L. Hardman: "Summary...we conclude that a dry weight increase in the amount claimed by Harvestall in their "Chillcuring" process is not possible. In fact, the research evidence indicates that when shelled corn is subjected to the environmental conditions that exist in a Harvestall 'Chillcuring' system there will be a dry weight decrease..."

Notwithstanding this adversary conclusion HARVESTALL holds to the authenticity of its science as documented in this testimonial ad. HARVESTALL believes Crop News 40 is mistaken in its science and that its intended purpose was to publicly discredit HARVESTALL's science and representations, and hat it has done so by asserting false presumptions...

[The Minnesota Extension Service turned HARVESTALL claims over to the Minnesota Attorney General for prosecution. I personally responded to the Minnesota AG's inquiry. The conclusion of the AG was that the issue was a dispute of science, and not yet resolved. No action was taken against HARVESTALL, which continued its market claims and enjoyed phenomenal market acceptance.]

3. The Case for Interdisciplinary Science

Given the now known degrading effects of heat on grain and high costs of energy, hot air drying of grain cannot be justified either scientifically or economically. That the land grant universities are largely responsible for causing widespread acceptance of kiln-drying corn grain imposes on them the obligation of informing the public of the negative consequences of it. Neglect to do this is breach of science and breach of public trust.

How did universities ever get into this predicament? Surely it is consequential from failure to anticipate the sensitivities of seeds as biochemical organisms and criticalness of environment as it effects biochemical values. Chemistry, physiology, physics, atmospheric science and other scientific disciplines converge in the art of caring for grain [seeds]. The interaction of these disciplines has been overlooked, probably in part because of politics of governmental distribution of money and governmental assignment of public responsibility through the land grant system.

America's granary has been entrusted to unqualified keepers. Either the keeper must be able to become qualified, or else government should reassign this public trust to another keeper, perhaps to cereal chemists, to plant physiologists. With all due respect, agricultural engineers breach science and the public-trust in the pseudo-science they promote. Their late endorsement of low-temperature/ natural-air drying has been by the force of market pressures. Neither the government nor the public should condone their breach.

Erroneous presumptions inevitably give rise to pseudo-science. The presumption that seed-life is inconsequential to commercial value of grain is offensive even to a novice scientist, and is justifiable by no known standard of science. Much less is persistence in error excusable in light of decades of research and farmer experience, which document devastation of grain by heat, inflationary waste of agricultural resources and loss of foreign markets because of degraded [grain] quality. Country elevators have become time bombs from dust accumulations of degraded corn. [Grain dust explosions and fires at country elevators are not uncommon.]

The facts of record suggest that more than oversight has been at work in view of unembarrassed public aggressions by agricultural engineering and extension service personnel against the teachings and marketing efforts of HARVESTALL. The obvious way for land grant universities to restore public trust is to be honest with science, even if it supports another's work of science.

These are still the "ChillCuring" benefits to grain, to farmers:

"ChillCuring" allows farmers to field-shell corn while it is "wet" and uncured; "ChillCuring" ventilates stored grain with controlled volumes of atmospheric air and optimizes the after-ripening of the seeds (by heat removal from the grain) even as freed grain moisture is removed from the storage bin. Grain ripens to full food and weight values as it is stored, and the farmer uses free atmospheric air to dry it with least energy consumption.

The validation of Harvestall's seed science of "grain ChillCuring" is now a matter of public record. The pioneer seed science of Sylvester Steffen teaches "ever-normal" corn keeping; it is disclosed in product and process patents, U.S. Patents: 3,408,747; 4,045,878; 4,045,880; 4,053,991; 4,077,134; 4,148,147; 4,175,418; 4,247,989; 4,256,029; and 4,800,653; Canadian Patents: 1,086,052 and 1,090,562; and it has been validated by on-farm usage and by legal challenges in U.S. Federal Courts of Minnesota and Indiana, and in Iowa District Courts of Chickasaw, Jones and Linn Counties.

Historical note: Harvestall's products and technology were marketed from 1977 to 1982 by Harvestall Marketing, Inc., Trimont, MN, formerly, Persson Grain Company. Governmental interference, including, the disallowance of previously allowed energy tax credits for the qualifying "active solar" system, the discontinuation of the storage facility loan program to farmers, and the [USDA] University Extension Service's active endorsement of kiln drying and published discrediting of Harvestall ChillCuring conspired to precipitate the business collapse of Harvestall Marketing, Inc, in the 1980s. The continued depression of the agricultural economy thereafter stymied the recovery of the grain storage business. The Harvestall ChillCuring System is not now being marketed.