DISCOVERY OF CHARGE DENSITY PLASMAS IN WATER AND LIVING SYSTEMS

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ABSTRACT

This paper presents a rigorous examination of Charge Density Plasmas (CDP) and the molecular mechanisms affected by their formation. Charge Density Plasmas have been discovered in both living and non-living systems, including plants, water, people, animals, and soil, although only plants and water are presented in this paper. The properties of CDPs are consistent with micro-plasmas that are self-organizing, internally generated, and very sensitive to local and environmental factors. The formation and dissipation of Charge Density Plasmas are related to the formation of molecular clusters and isomer configurations, and can be described using a mathematical model based on an asymptotic time function, as well as perturbation kinetics and reaction rate theory.

In experiments with living plants it has been found that CDP pulses give evidence for an internal current moving through the plant stem, and each time a CDP pulse forms, an associated magnetic pulse can be simultaneously induced in a nearby probe coil attached to a separate circuit. When a magnet on a pendulum is moved back and forth laterally across the stem, regular periodic oscillations are induced in the micro-plasma system within the stem. When moved longitudinally or vertically along the stem, these periodic oscillations disappear; again consistent with the plasma model as described by equation (3) in the text.

Experiments with distilled water show that CDP pulses propagate in water, and do so differently in the North-South direction than they do in the East-West direction. These pulses appear to travel through one another without interference and thus exhibit the properties of soliton waves. Adding a small amount of ionic salt (KCl at 10 mM) greatly increases the plasma oscillations and their complexity, which is attributed to *cyclotron resonance* between the charge density pulses and background ions.

CDP diurnal data taken from distilled water 15-20 times per day for several months show distinct differences between the N-S and E-W curves. There is also a common feature in the form of a regular early morning maximum peak amplitude at approximately 7:00 a.m. This CDP peak appeared in over 90% of the diurnal data sets and may be the result of the fact that electron density in the atmosphere is more than 100 times greater in the daytime than at night, increasing rapidly at sunrise.

KEYWORDS: Charge Density Plasmas, Microplasmas, Water isomers, Self-organization, Plasma oscillations, Orthogonal effects, Anisotropy

INTRODUCTION

Over the past fifteen years, ongoing investigations at Pinelandia Laboratory have been directed toward understanding the organization and operation of ubiquitous charge density pulses, or more specifically Charge Density Plasmas (CDP) discovered in both living and non-living systems. In the original publication by Levengood and Gedye, these organized CDPs were historically related to the 1939 work of Burr and Northrup, presenting a large body of evidence demonstrating that all living organisms possess what was then termed an Electro-Dynamic Field.[1,2] In more recent studies we have found that these Charge Density Plasma forms are internally generated, self-organized energy systems with properties that can be readily quantified without the application of any form of externally applied electrical potentials or impressed high-frequency fields. Through the utilization of perturbation kinetics and reaction rate theory, it was subsequently demonstrated that CDP formation in living systems is robustly interactive with enzymatic processes.[3] From experiments conducted over the past year, it has become quite clear that these plasma forms are composed of organized charge carriers with properties far more complex than those observed under conditions of classical electronic conduction.

In order to rigorously examine the question of the specific molecular mechanisms involved in CDP formation, we are currently using distilled water as the study system. Justification for using distilled water as our comparative model system is made apparent when considering the fact that in general, the internal make-up of living systems is composed of over 90% water, both bound and free. By doing this we can examine plasma formation and structure without the interference of complexities introduced by the numerous, metabolically-related reactions that are constantly taking place in living systems. By systematically adding background atoms into the water network, and examining their influence on CDP formation we find that all self-organized plasma patterns, whether in distilled water alone or water with an additive, follow exactly the same, empirically derived mathematical model. This model is based on an asymptotic time function which precisely describes the rate of dissipation and/or formation of Charge Density Plasmas.

One of the major points that we want to make here is to direct attention to the fact that CDP forms have characteristics that parallel those in known plasma systems. Their properties and interactions follow a similar mathematical framework as advanced in both plasma physics and astrophysics, where the concepts of Prof. Hans Alfven have been particularly useful.[4,5]

In this report we present studies with both water and plants, each of which show that plasma formation is related to the dynamics of molecular clustering and spontaneously-generated isomer configurations and their subsequent transformations. These shifts and reorganizations of molecular structure can be extremely rapid. At the present time, in most Laboratories, examination of isomer transitions is done with x-ray spectroscopy and laser devices designed to deliver femtosecond (10-15 sec.) pulses.[6,7] These probes provide information concerning changes in optical absorption bands which take place over very thin time slices, yet in most cases do not offer a wide spectrum of information on the construction details and dissipation of the isomers and clusters themselves.

When isomers or clusters form, they interact with background ions in the media and readily produce self-organized plasma pulses that are capable of changing the free energy of the system. External energy input into water, as for example, photons produced from a laser source have been shown by J.R. Clarkson, et. al. to produce energy shifts in single water molecules, which subsequently alter energy thresholds for isomerization in a complex molecular system.[8]

Over the last two decades, the authors of published scientific papers related to the basic structure of water have pointed out the unique complexity of organized hydrogen bonding and transport water. Alan K. Soper very eloquently summarizes current thinking, "The apparent simplicity of the water molecule belies the enormous complexity of its interactions with other molecules, including water molecules."[9] As will be outlined in the following sections, our data demonstrate that these complex, organized molecular clusters and subtle isomer shifts in water are directionally-oriented, and very sensitive to both local and environmental factors.

Investigation of the directional aspects of CDP pulses was given impetus by a paper published in this Journal authored by Dr. B.J. Koopman and Dr. R.A. Blasband. In their paper they discussed empirical data and presented theoretical postulates related to directionality and anisotropy in subtle energy interactions.[10] A subsequent section of our paper discusses empirical data we obtained with systems designed to examine, simultaneously, the bi-directional CDP transport at orthogonal collector plates. These collector plates were positioned within a chamber containing distilled water initially, and later, water with added ionic salts. During isomer shifts, CDP patterns produced at North-South (N-S) collector plates disclosed quite different energy patterns and characteristics compared with those produced at the East-West (E-W) orientation.

In plant stems, the water transport is unidirectional, primarily vertical, and this makes them an ideal model system for examining vector-related responses in CDP transport. By designing a system to examine CDP movement in living plant stems, we were able to confirm that isomer and molecular cluster transitions in plant tissue could be explained by the same basic model of plasma formation as found in the water studies. Based on specific vector-related responses, these orthogonal systems clearly establish the validity of the hypothesis that plasma formation and dissipation are fundamentally important factors involving energy transport in both living and non-living systems. A theoretical model utilizing vector algebra involved in plasma formation was very useful in explaining various anomalous aspects of our work.

EXPERIMENTAL SYSTEMS AND METHODOLOGY

The various types and forms of organized Charge Density Plasmas (CDP) were examined experimentally with the two systems depicted in Figure 1A and 1B (not to scale).

In Figure 1A, a clear plastic sheet holds a living plant stem section in a vertical position. Turgor is maintained by placing the ends of the stem inside 35mm film canisters containing sterile cotton saturated with distilled water. The aluminum foils are charge collector strips which extend down inside each canister and are in contact with the moist cotton. Early on we found that moist cotton acts as a very efficient wave-guide for the electric current formed by the CDP pulses. To produce a CDP trace, the micro-switch is closed (Figure 1A) to provide short-circuit conditions with the resulting CDP wave pattern recorded on the chart recorder, the leads from which are attached to the opposite ends of the 1.0K ohm resistor.

The second system, shown in Figure 1B, was utilized to simultaneously examine bi-directional CDP formation within water and water solutions. The collector foils were prepared from aluminum foil (Reynolds Wrap) and extend vertically down the sides of a 10 cm crystallization dish. Each foil was 2.0 cm wide and extended up and over the top of the container, with approximately a 5 cm section extending outward to serve as an attachment point for the cables from the chart recorder. The aluminum foil strips were held in place with Dow Corning stopcock grease, which also prevented liquids from being transported out of the dish by capillary action. The foils were carefully positioned so that one pair was in the (N-S) compass direction and the second pair in the (E-W) direction. Each pair of charge collectors was on a completely independent circuit from the pair in the conjugate direction. The micro-switches in each circuit were simultaneously closed in a short-circuit test to insure that the CDP responses were precisely time related.

Analysis of chart recorder data provides information concerning the energy involved in the formation of the internal isomers or molecular groupings. For example, the peak amplitude (Pa) is taken at the first point on the chart recorder trace where the current begins to decrease. This inflection point occurs around 0.1 second after closing the micro-switch.

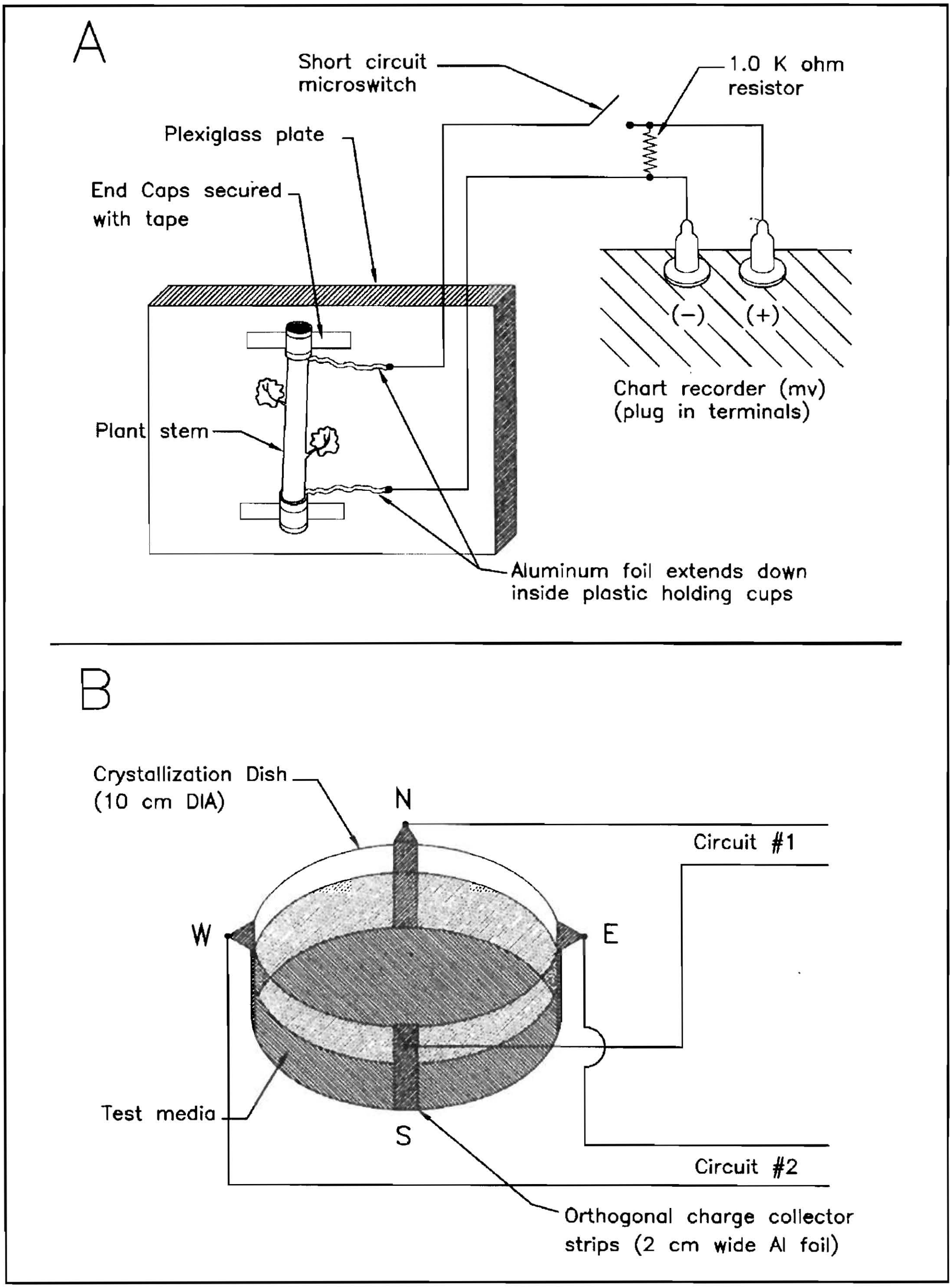
RESULTS

After the Charge Density Plasmas reach the peak amplitude (Pa), the current level i drops off very rapidly, and in water as well as every system we have examined, follows a very precise exponential-time function given by:

$$i = k(t^{-1/2}) + b \qquad (1)$$

Where t is the elapsed time in seconds,

Figure 1. Diagrams of CDP systems: A. Is system for recording CDP levels in plant stems. B. Apparatus for simultaneously examining CDP in orthogonal directions in water solutions.



minutes, or hours, depending on the particular time span being tested, k the slope constant related to the rate of current dissipation, and b the intercept constant. The data shown in Figure 2A and 2B were taken from a typical dissipation curve formed in purified water (distilled), and plotted according to the exponential-time function (Eq. 1). As will be demonstrated in later sections, this high correlation coefficient (r = 0.99) is typical of data obtained when using the Equation (1) algorithm.

I. Empirical Support for a Micro-plasma Theory

Most plasma systems have both an internal electric field **E** and a magnetic field **B** component. These force fields are organized into a very stable electro-dynamic structure, which is not easily perturbed by external electric or magnetic fields. From the organizational physics of plasma formation, any electric current **i** developed within a plasma complex always flows normal or at right angles to the magnetic field. Cowling refers to this current flow as a "pressure effect" which produces a drift normal to the direction of the magnetic field.[11] This internal force $\mathbf{F}_{int}$ is given in vector notation as,

$$\mathbf{F}_{int} = (\mathbf{i} \times v\mathbf{B}) \quad (2)$$

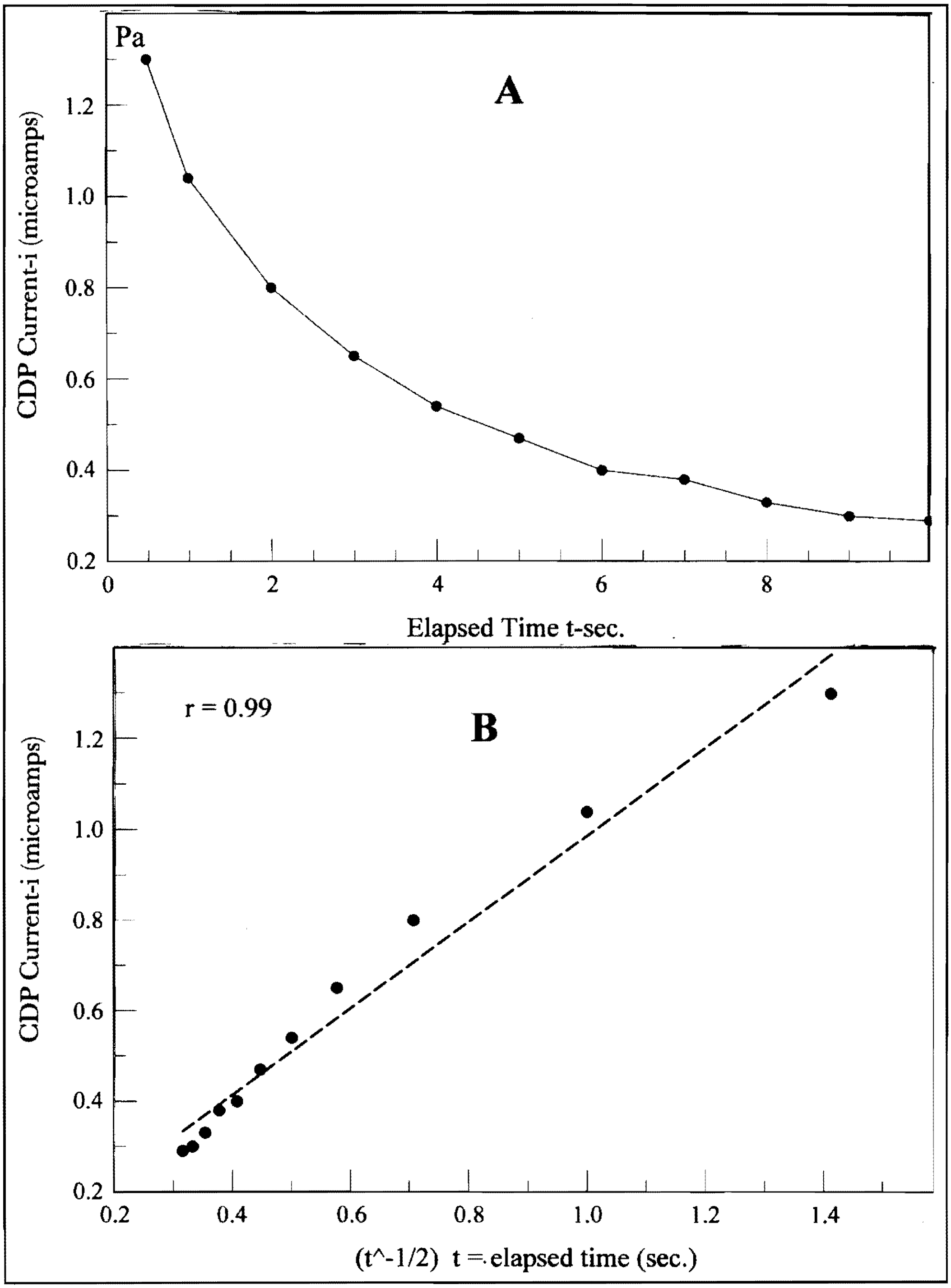
where v is the velocity of the lateral component of the ionic drift current. If we find evidence for coupling between the **i** and **B** forces taking place during active CDP flow, then we have clear evidence that the micro-plasma hypothesis is valid.

For this phase of the study we used living plant stems as the test organism. Sections in the range of 10-12 cm long and 1.0 cm diameter were mounted vertically on a sheet of clear plastic as shown in Figure 1A. The aluminum foil strips extend down into the canisters where they contact the moist cotton pads and serve as charge collector plates. The moist pads efficiently transfer the CDP pulses from the plant stem to the collector plates and prevent tissue dehydration. The stem sections were oriented vertically with the acropetal end serving as the anode (+) collector and the basipetal end as the cathode (-) collector. When the circuit is closed (Figure 1A) a spontaneous, robust CDP pulse is recorded (Figure 2A), thus providing quantitative evidence for the current level $\mathbf{i}_{int}$ in Equation (2).

In order to search for the putative magnetic component **B** in Equation (2), a very sensitive probe coil consisting of 80,000 turns of copper wire was mounted near the mid-point of the test stem.[12] It is important to point out here that this coil had no physical or electrical contact with the plant tissue. The probe coil operated within another monitoring circuit completely independent of the circuit containing the test stem and CDP apparatus. Its purpose was to confirm or reject the notion of a magnetic field associated with a CDP pulse directed up the test stem.

With this arrangement it was found that in every case when a CDP pulse formed in the plant stem, a magnetic pulse was simultaneously induced in the probe coil. The

Figure 2. Data from a typical CDP dissipation in water. A. Points taken directly from chart recorder; B. Raw data in A, plotted according to empirical algorithm (equation-1 in text).



presence of a magnetic field directly associated with the current flow in the plant stem is a firm confirmation of the presence of very structured electro-dynamic mechanisms in the living tissue.

It is the nature of plasma systems containing coupled electric and magnetic fields to be relatively impervious to external electric or magnetic fields. However, if the external perturbation is of sufficient magnitude, one can set up electrical current oscillations in the system. In the case of a plant stem, and as suggested in Equation (2), we would expect the perturbations to take place according to the ($\mathbf{i}$ x $\mathbf{B}$) vector component of the CDP wave forms. To induce external perturbations, the probe coil was removed and the plant stem was placed *under short-circuit conditions.* A fraction of a second after the CDP trace reached maximum amplitude (Pa), a cylindrical 5000 gauss magnet (2 cm dia., 2.5 cm long; pole faces at each end) was oscillated in a horizontal or lateral direction, with one pole face passing within 2 mm of the plant stem. This was accomplished by mounting the magnet on one end of a pendulum system (composed of non-magnetic material) which could be set in motion to induce very precise harmonic, oscillatory forces on the internal plasma system.

The lower recorder trace in Figure 3 shows that with the lateral oscillation of the external magnetic field ($\mathbf{B}_{ext}$.), very clear, uniform perturbations were induced in the internal micro-plasma system. It should be noted that at each half cycle, the direction of the induced pulses changes polarity. This is explained by the fact that as the external magnet approaches the plant stem, the force vector is 180° out of phase with the previous half cycle.

Next, without any other changes in the system, the external magnet was oscillated along the longitudinal axis of the plant stem. The resulting CDP, as shown in the upper trace in Figure 3, disclosed minute, irregular perturbations, but the amplitudes were less than 1/6 those produced in the lateral mode. Thus the induced uniform perturbations shown in Figure 3 are clear evidence that the internal CDP pulses have electric and magnetically coupled fields that are directionally sensitive to a strong external magnetic field.

When the external magnetic field was directed to move laterally, it reinforced the internal magnetic field; but when applied in a vertical or longitudinal direction along the stem, it was at 90° to the $\mathbf{B}_{int}$ field, which accounts for the very low amplitude pulses along the upper curve in Fig. 3. From Equation (2), these force effects produced by the external magnet can be defined by the vector relationship,

$$\mathbf{F}_{int} = (\mathbf{i}_{int} \mathbf{x}\ \mathbf{vB}_{int}) + \mathbf{B}_{ext}\ (\mathbf{cos}\ \phi)\ (3)$$

where f is the angle between the internal magnetic field vector and the directional path of the external magnetic field. For example, in the case of lateral motion, the path of the external magnetic field was parallel to the internal magnetic field, and both are normal to the longitudinal axis of the stem, therefore ϕ = 0° and cosϕ = 1,

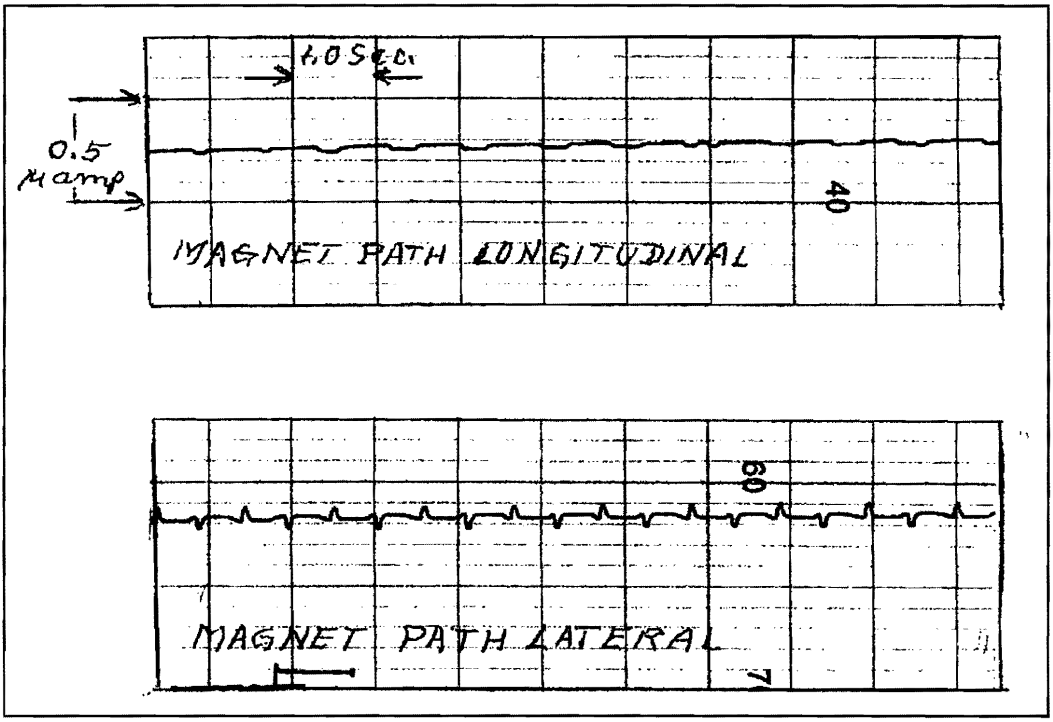


Figure 3. Plasma oscillations in a plant (Pelargonium) stem produced by an external magnet-pendulum system. Differences in pulse wave-form due to lateral vs. longitudinal path directions in the external magnet.

resulting in a maximum perturbation in the internal drift velocity as shown in the lower trace in Figure 3. When the external magnet was applied so that its field direction was at a right angle to $\mathbf{B}_{int}$ within the CDP pulse traveling up the stem of the plant, $\phi = 90°$ and $\cos\phi = 0$, therefore the last term in Equation (3) becomes zero, and the external field, as shown in the upper trace in Figure 3, had essentially no influence.

These periodic oscillations (lower trace Figure 3) are produced by electrons being temporarily displaced from their equilibrium positions within the complex of molecular configurations in the plasma systems. In a book honoring the work of Professor David Bohm, the theoretical physicist Dr. David Pines provided an excellent outline of the mechanisms involved in plasma oscillations.[13] In general, we have what he referred to as "cages" of both negative (-) and positive (+) ions, which self-organize into complex molecular structures. Within these ion cages there will be a suppression of charge density fluctuations by the coulomb interactions, thus accounting for their stability. During the external application of a sufficiently intense magnetic field, there is a charge imbalance in these cages, causing electrons to burst forth. Now we have too many positive charges for the remaining electrons and negative ions. This back and forth motion of charges in and out of the isomer cages sets up measurable oscillations which are observed to be longitudinal waves, since the electron density changes are in the direction of the current path through the media.

II. Independent Confirmation of CDP-Isomer Related Transitions

At this juncture it should be pointed out that these CDP pulses and associated magnetic effects are not unique with plants. Their presence has been confirmed in other living systems, in water, and in soil. One of the first clues that basic molecular organizations and isomer transitions are involved in CDP formation was discovered in empirical data published by V.I. Tikhonov and A.A. Volkov, relating to work on the separation of water into its ortho and para isomers.[14] By using a selective absorption technique, they obtained data showing the time dependence of the ortho-para ratio change over a 12-hour period.

Of interest here was the fact that their plotted curve of raw data appeared tantalizingly similar in form to the time dependence of CDP transitions in water. The question then arose as to whether these absorption data would show any agreement with our empirically-derived algorithm (Eq. 1) describing the time-dependence of CDP formation in water. With a 6X loupe used as an aid to precisely define coordinate points, ortho-para transition data were extracted from Figure 1C in the Tikhonov, Volkov paper. These o/p ratios were then plotted as a function of time, according to the CDP algorithm in Equation (1). The resulting linear regression curve shown in Figure 4 gave the incredibly high correlation of $r = 0.998$ for data taken above the 3:1 equilibrium point. Data extracted below the 3:1 level in the very low yield (low slope) portion gave a correlation of $r = 0.953$. In both cases we observe very excellent agreement between the empirically-derived function from CDP dissipation curves and the time-dependent isomer transitions as determined by absorption technology.

III. CDP Along Orthogonal Paths in Water Solutions

Following the discovery of the very apparent directional influence of a magnetic field on CDP pulses in plant stems (Figure 3), the decision was made to design a system to quantitatively examine directionally propagating CDP pulses or isomer shifts in water systems. For this purpose, aluminum foil charge collector plates were mounted vertically in a crystallization dish, (Figure 1B). With two separate circuits it was possible to examine CDP wave formation along the (N-S) and (E-W) geophysical coordinates. In this system we found that when water is first introduced into the orthogonal chamber, the progression of CDP formation is radically different in the orthogonal directions. The data in Figure 5 were obtained from distilled water and recorded at 10-minute intervals over approximately the first two hours in the system. The changes in the (E-W) orthogonal charge collector strips indicate the isomer transitions were "phase locked" into a 10-minute cycle of oscillation. Concurrently, the isomers in the

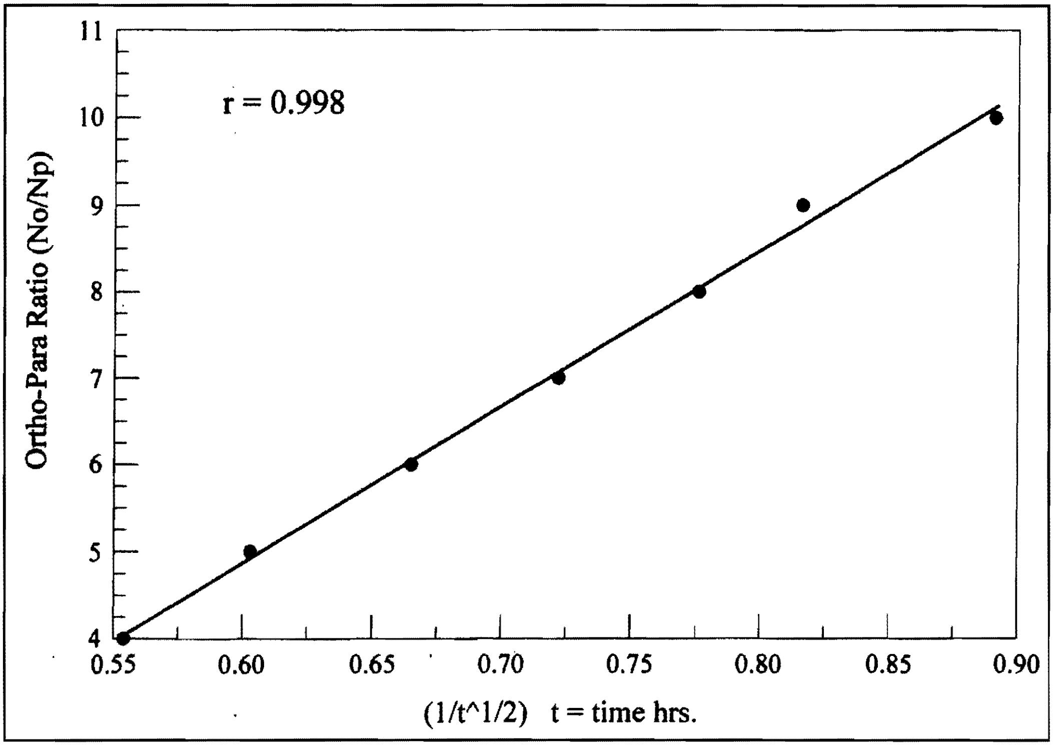


*Figure 4. Isomer transitions in water plotted by using the equation-1 algorithm. Data taken from V.I. Tikhonov and A.A. Volkov, Science, **296**, pp. 2363 (2002).*

(N-S) pair were going through a very smooth transition, and when compared with the Equation (1) algorithm, a correlation of $r = 0.99$ is obtained; whereas, the data from the (E-W) transitions gave $r = 0.13$, indicating there were competing, or more complex, molecular transitions taking place in the (E-W) pathway.

Here, we have CDP pulses, which travel at right angles in the water media and appear to pass through one another with a minimum of interaction. This particular effect can only take place if the CDP waves are considered to have what is known as soliton properties.[15] In support of a soliton model, we have abundant data showing that under short-circuit conditions, a CDP pulse reaches peak amplitude (Pa level) within a fraction of a second after the circuit is closed. This means that the plasma waves travel too rapidly to be explained by classical diffusion models. After the circuit is opened, the CDP waves spontaneously reform and essentially maintain their previous form; all of these characteristics being in agreement with the properties of soliton-wave formation.

It now seemed worthwhile to apply the magnetic-pendulum device in conjunction with the orthogonal water system (Figure

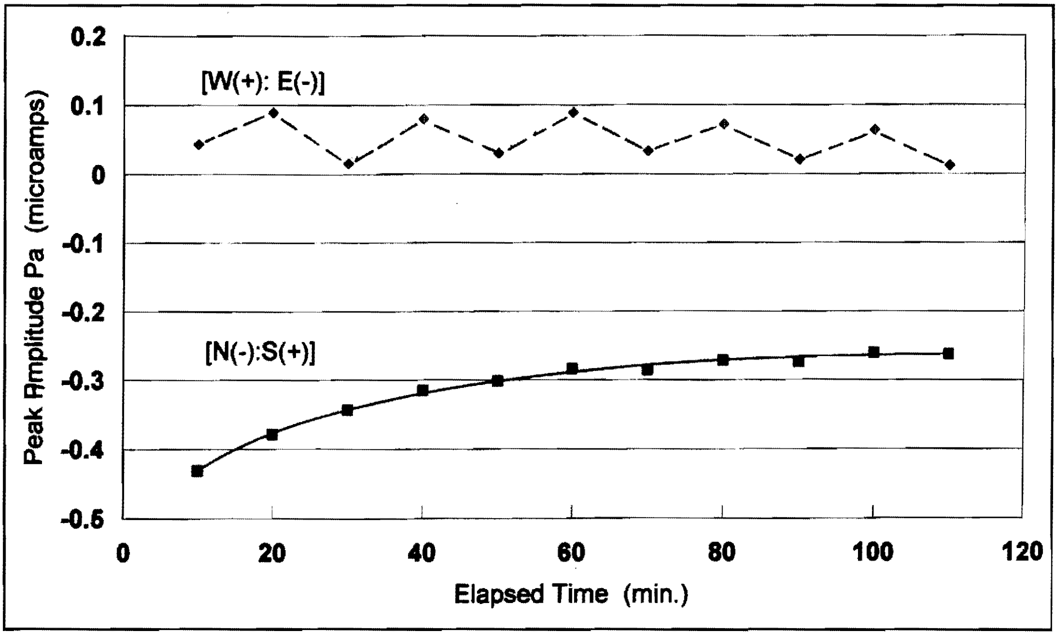


Figure 5. Time course of CDP formed along orthogonal directions in distilled water. Possible "phase locking" effect in the (E-W) curve.

1B) to examine directional effects in water media. In these experiments the procedure was to simply pass a pole face of the 5000 gauss magnet over the surface of the water, but keep it restricted to orthogonal trajectories. As in the magnet-pendulum studies with plant stems, the recorder traces were obtained with the CDP circuit under shorted conditions. The plasma oscillations shown in Figure 6A were obtained in distilled water, with the magnet-pendulum system directed in a (N-S) pathway. The lower trace in Figure 6A has very minute, periodic oscillations in the (E-W) orthogonal system, but in the upper (N-S) trace they were not of sufficient magnitude to be detected.

In our work with water solutions we find that the interactive influence of ions introduced into the water can have a marked effect on the formation of CDP pulses. An example of this background ion effect is illustrated in Figure 6B, where we show the interactive influence of KCl (10mM) on the magnetically-induced pulses. As with the distilled water, we find that the amplitudes are much higher in the (E-W) pair than in the (N-S) pair.

The more complex wave forms in the pulses within the KCl solution may be due to molecular, cyclotron resonance mechanisms as outlined by Dr. Robert Becker.[16] He points out that "cyclotron resonance may be produced any time there is a steady magnetic field combined with an oscillatory electric or magnetic field acting on a charged particle." As applied in our studies,

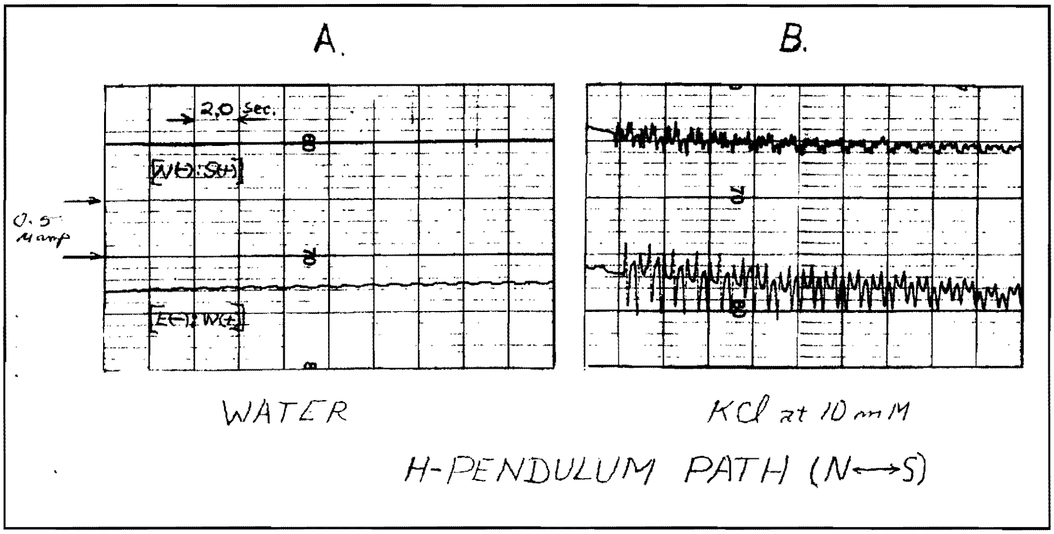


Figure 6. Comparison of magnetic pendulum-induced oscillations in the orthogonal system containing A-water, and B-KCL at 10 mM concentration. Illustrates effect of background ions of CDP wave forms.

the charged particles are made up of stable plasmas that have self-organized from molecular groups to form isomer configurations. In Figure 7A and 7B it is very interesting to note that if the magnet-pendulum direction is changed 90°, the pulse amplitude differences in the orthogonal systems are also reversed. From Equation (3), a 90° shift in pendulum direction would be expected to produce a concomitant shift in the amplitude differences of the internal plasma oscillations, and that shift is very clearly substantiated in the Figure 7 trace data.

IV. Formations and Molecular Mechanisms Involved in CDP Organization

Up until the middle of the last century, students of physical chemistry were taught that the molecular structure of water consisted of a very simple tetrahedral arrangement of hydrogen-oxygen bonds. Furthermore, water was considered as being a simple catalytic medium in which more complex ionic compounds could interact with one another. Over the last two decades, this simplstic picture of the structure of water has changed about 180 degrees. Knowledge obtained from studies involving x-rays and laser spectroscopy has demonstrated that water has exceedingly complex and dynamic structures from which new facts are constantly being discovered.

The data presented here are in complete accord with these currently emerging findings. In order to develop a working hypothesis concerning the structure and origin of CDP waves, we found it necessary to consistently refer to the following list of organizational properties and their interconnections.

- Charge density plasma waves are subtle energies made up of interactive plasmas that

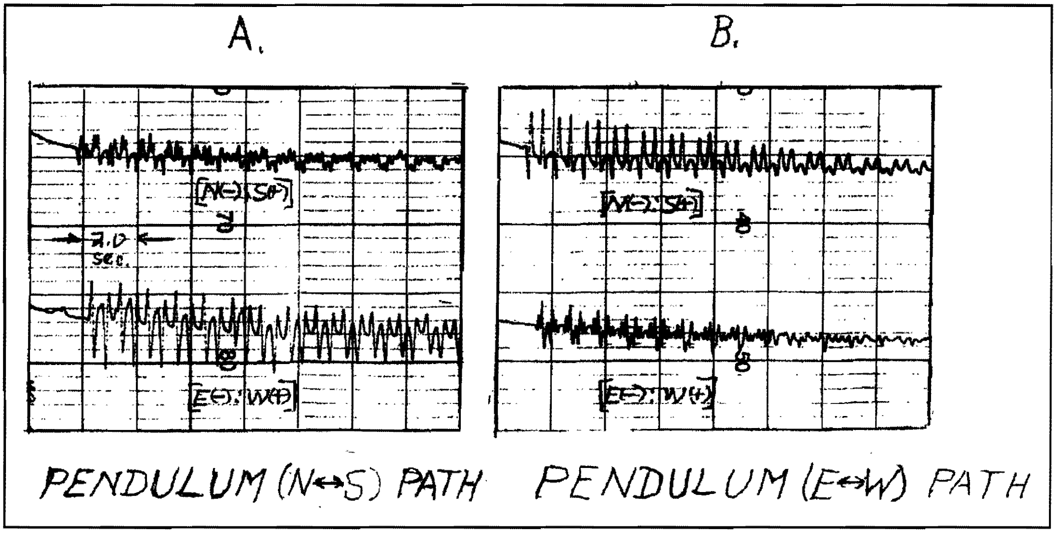


Figure 7. Magnet-pendulum oscillations, showing a 90° shift in amplitude characteristics as predicted by equation-3 in text.

have self-organized from molecular groups and formed isomer configurations.

- The reaction times for these isomer transitions can range from femtoseconds to hours.
- The electrical properties of CDPs are such that the application of internal, short-circuit conditions produce rapid changes in ionic and proton transport pathways through the molecular network.
- When the internal short-circuit condition is removed, the CDP pulses rapidly return to their original equilibrium state. The most prevalent recovery time in the various systems studied here were in the range of five minutes or less.
- The fact that the CDP pulses in all systems, both living and non-living, can be precisely described by the same mathematical function given in Equation (1) (see first part of Results section) demonstrates the universality of their architecture.

One of the most intriguing and persistent questions concerning the data in the early phases of our studies related to the rapid transitions from positive to negative Pa values, particularly when examined in living systems over intervals of time. In both plants and the human animal we have found that these polarity changes are directly correlated with very subtle metabolic transitions in the organism. In the early work, Levengood & Gedye found very definite associations with metabolic states and the CDP levels.[1,3] For example, using carrot roots, the activation energy of CDP formation was 9.4 kcal/mole, a value considerably lower than found in most chemical reactions, and it was suggested that, in the case of CDP formation, the energy barrier to the activated state may be considerably reduced by electron-proton associations in the self-organized isomer systems.

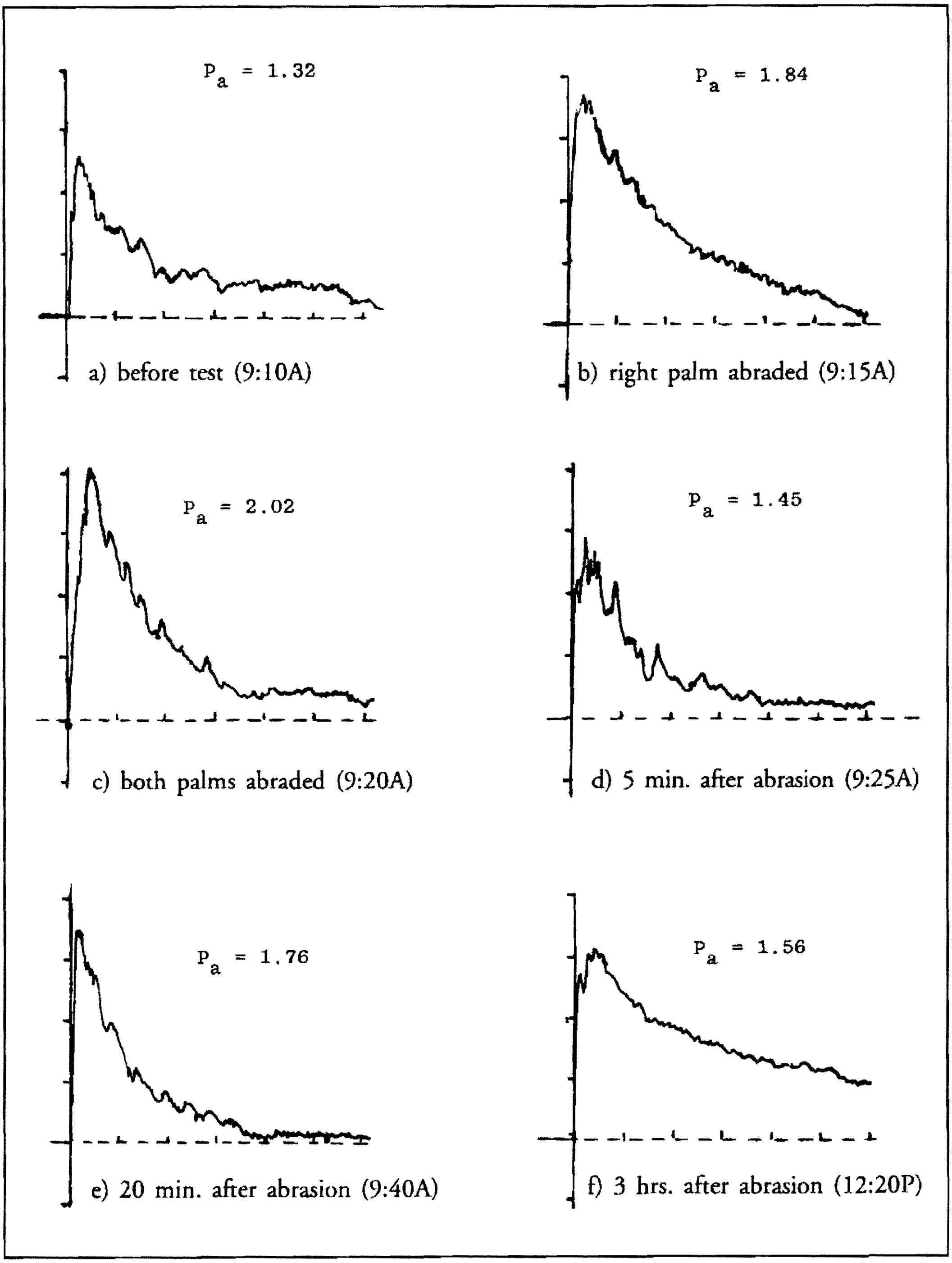
By examining these isomer transitions in a large body of data, we find that even very subtle alterations such as skin abrasions on the palms of the hands are reflected in metabolic changes throughout the organism. By closely examing actual traces such as those in Figure 8 (first published as Figure 6 in Levengood & Gedye[1]), it can be noted that, following the abrasion treatments, Traces C, D, and E show significant secondary pulses along the envelope of the trace patterns. This is particularly evident in Trace D, taken five minutes after the abrasion. These negative spikes are far less evident 20 minutes after the skin abrasion, and completely absent in the trace taken three hours after the abrasion. During the abrasion process, cells in the palms of the hands are literally being torn apart and in this catabolic condition, produce a decrease, relative to the controls, in the CDP current level within the 10- to 30-second segment of the trace patterns. This decrease is manifested as a shift toward the 0 axis, as depicted in Traces C, D, and E. However, after three hours recovery, Trace F shifts back up from the 0-axis, and, because of the energetic internal repair and cell reorganization taking place through anabolic processes, the area under the curve is now greater than the area under control Trace-A taken before the abrasion.

Another example of this shift from anabolic (+ polarity) to catabolic (- polarity) is found in Figure 9, in which the hands were exposed to UV light (first published as Figure 9 in Levengood & Gedye[3]). For water, as well as living systems, there is a UV frequency where light is strongly absorbed because the photon energy matches energy differences between filled and empty electron energy levels. The data in Figure 9, Trace A shows the CDP level of the control before exposure. After 1-minute of exposure to a low-intensity UV tube of 5-watts, there is a pronounced fall in the CDP level and an obvious change of shape in the traces that follow, with Traces B, C, and D demonstrating that the organism has been negatively affected by the absorption of the UV light. Within 3 minutes of exposure to the high energy UV, the CDP in Trace B drops dramatically, showing pronounced negative spikes. At 10 minutes after exposure, cell damage has become sufficient to the point that Trace C drops below the zero baseline into the negative catabolic region. Then, as in the above discussion of skin abrasion, we again find that 30-minutes after exposure to UV light, the CDP Trace D has moved more strongly into the positive, anabolic region, and the area between the curve and the baseline is now much greater than the area between baseline and curve in the control, Trace A, because of the intense anabolic activity designed to restore homeostasis.

V. Diurnal Changes in Orthogonal CDP Systems

Over a period of several months during the fall of 2005, CDP data were collected from an orthogonal system containing water as the test media. Each day around 15-20 recorder traces were made at 10-30 minute intervals between 2:00 a.m. and 8:00 p.m. As these data accumulated it was apparent that there were large point-to-point variations in the Pa values, and although data were taken simultaneously in the (N-S) and (E-W) orthogonal pairs, their changes in magnitude were obviously not in phase.

Figure 8. Effect of skin abrasions on CDP traces taken in the palm of the hand. a) before test; b) and c) show slight increases in P_a due to thermal expansion from frictional heating; d), e) and f) curves at various times after abrasion.



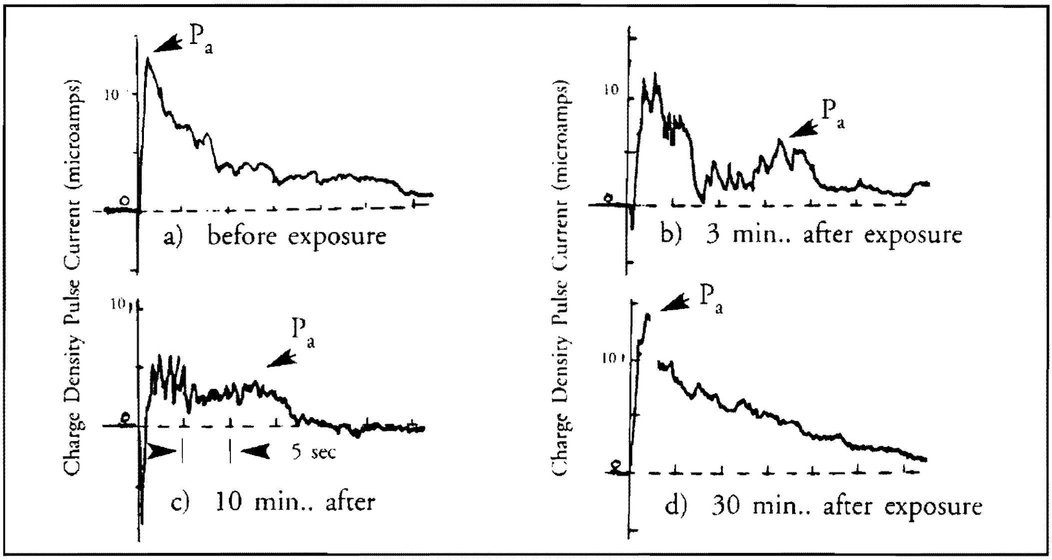
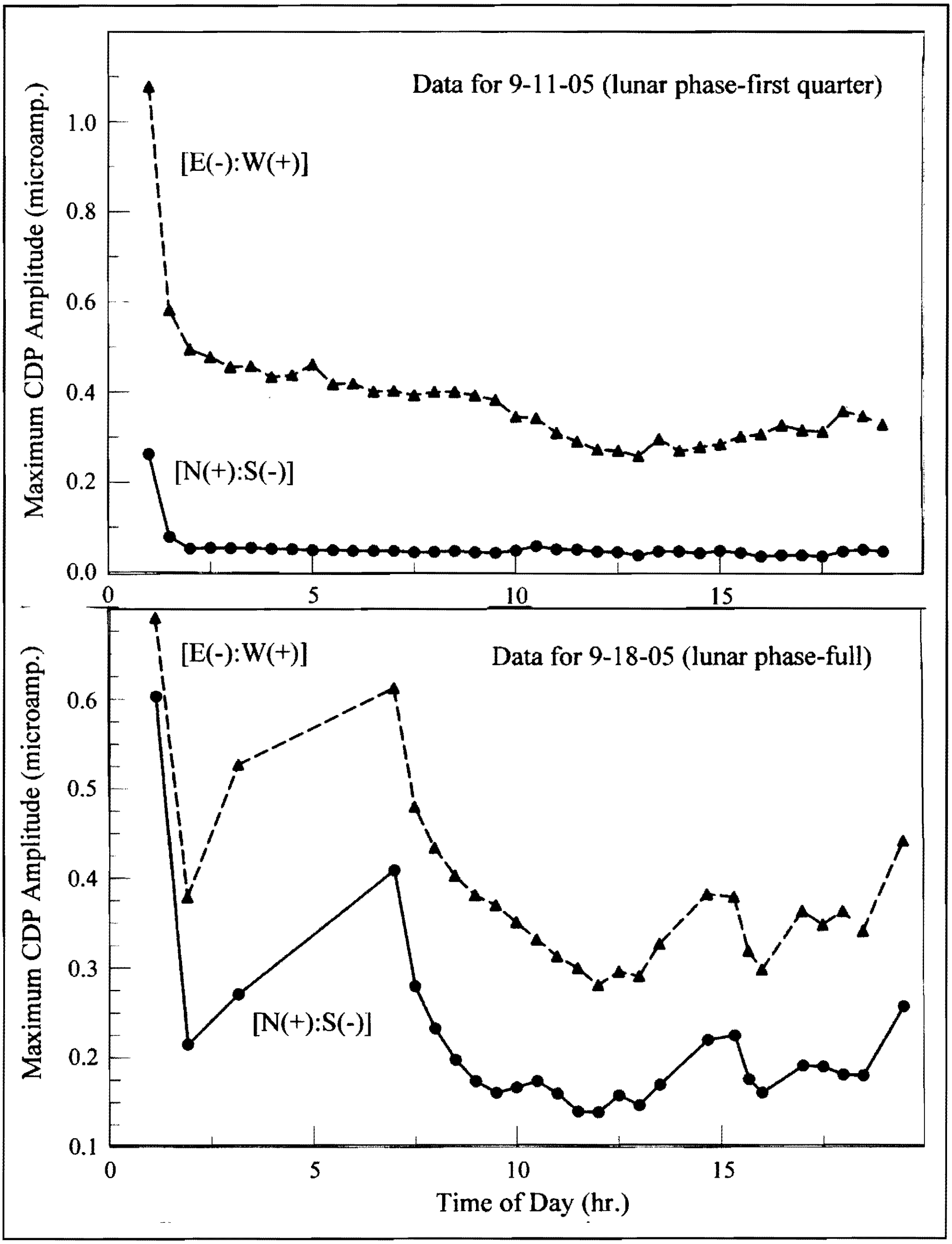


Figure 9. Recorder chart traces showing CDP dissipation curves obtained by exposing the palms of the hands to a UV tube (hands held about 2 cm from tube during a 1 minute exposure).

In Figure 10A and 10B, data taken a week apart were chosen to illustrate the difference between orthogonal sets of data taken at the same time points. For example, in Figure 10A the curves show very smooth CDP changes over the diurnal period, whereas, the data plotted in Figure 10B are typical of large fluctuations. There is one feature that all four sets of data have in common and that is the early morning maximum CDP levels shown in the data points at the far left of each data set. The fact that this early morning effect appears in over 90% of our diurnal data sets suggests that CDP formation is responding to environmental factors that are present each morning.

In Section III, data were presented which clearly demonstrated that the amplitudes of the charge density pulses could be greatly enhanced by adding KCl to the water. Thus, if there is a change in the ion environment in the atmosphere, this could, by the previously discussed cyclotron resonance mechanisms, drastically change the isomer transitions in water.[16] Therefore, these maximum points appearing in the early morning data may be related to the fact that the electron density in the atmosphere is over 100 times greater in the daytime than at night.[17] In the ionosphere, the electron density increases very rapidly at sunrise due to the production of electrons by x-rays and ionizing radiation associated with the solar flux. In addition, there is also a sunrise increase in local electric and magnetic fields due to space charge interactions.[18] Clouds of these solar-produced ions form plasmas which spiral down the earth's magnetic field (in a non-isotropic, N-S direction) and ultimately interact with the water in the orthogonal system.

Figure 10. Diurnal CDP levels for two different days in September 2005. In the upper set of data the diurnal changes are very smooth, whereas in the lower set the changes are more abrupt and of greater amplitudes. See text for discussion of these data.



As a final comment, in Figure 10 the data in the upper curve were taken on the lunar first quarter, and the data in the lower set were obtained seven days later on the full moon. Although the CDP activity was higher on the full moon, this pattern was not reproduced in data obtained during subsequent lunar cycles. Much more data is needed for an adequate parametric analysis.

DISCUSSION OF RESULTS

Ongoing research in this laboratory has now produced abundant evidence that Charge Density Plasmas constitute at least one form of subtle energy that is native to both living and non-living systems, is internally-generated, self-organizing, and is not the result of chemical, thermal, or mechanical actions triggered by external events or factors. The presence of CDPs in every form and system we have studied – including water, plants, people, animals, soil, and rocks – suggests that these energies point the way toward understanding the interactivity of all things and may reveal new data regarding resilience, homeostasis, and thresholds for transformation that have been previously unavailable to us.

Earlier CDP research on plants conducted by Levengood and Gedye was reported in this Journal and showed that different tissues in plants had differing levels of CDP energy.[3] In this paper we have shown that CDPs have both an electric current and an associated magnetic field, and thus have the basic characteristics of a plasma system.

We have also seen that these micro-plasmas—although responsive to the presence of other CDPs—do not interfere with one another, thus they exhibit the properties of solitons. Considering that: a.) each type of tissue in a plant has a distinct CDP signature, b.) that each form of CDP is associated with a distinct micro-plasma, c.) and that these micro-plasmas are operating without interference to one another due to their soliton properties, we can postulate an entirely new picture of a living plant, and perhaps all living things, as a matrix of interacting plasma fields that are self-organizing, homeostatic, and resilient.

If this is the case, and we have evidence that CDP changes polarity to the positive (+) range during anabolic processes, and drops into the negative (-) range during catabolism, we have an accurate and easily measurable system for assessing the effect of external factors and their subtle energies on the subtle energies and overall homeostasis of a given form or body.

We could also ask the questions:

- If CDPs are self-organizing, who or what is the basis of that self-organization?
- If CDPs are responsive to both local and environmental factors, including some that are global factors, then do we have a scientific basis for non-local effects such as thought and prayer for one another?
- If CDPs have the properties of solitons, which means that they move around and through one another without destructive interference, then could we say there is

a scientific basis for advancing the hypothesis that peacefulness and cooperation are primary in all living systems, eliminating the idea of competition and survival of the fittest?

When considering the studies of CDP pulses in water and the unexpected evidence of pronounced directional differences between North-South and East-West, we have further support for the anisotropic characteristics of space. If space is not isotropic, then we can postulate that there are energy differences in space whose unknown streams and power currents are available to us. We also have an intriguing factor that may affect the research into cold fusion or free energy research. Reports of cold fusion reactions were frustrating due to inconsistent results. Could that inconsistency be due to unknown forces and currents of energy in space that either accelerate or suppress an energetic reaction? This points to a need for further study of the anisotropy of space and currently unknown factors that could aid in the development of a variety of useful energies. The evidence from our study of water showing the similarity between CDP dissipation curves and ortho-to-para isomer transitions leads to the possibility that learning to create specific charge density plasmas might lead to the formation of new isomers with unusual physical characteristics that would be useful in manufacturing and other areas of life here on the planet as well as in space.

Consistent throughout all our research has been the observation that these CDP energies are internally-generated, self-organizing, and very interactive. It has also been our experience that the levels of CDP energy can be increased. This suggests that better plant nutrition might be achieved via techniques that increase the CDP levels associated with seeds, water, soil, or developmental factors in plants themselves.

If the micro-plasma is using free energy to drive translocation of nutrients through a plant, how does it know how to do this and what directs it? Further studies of Charge Density Plasmas could reveal information regarding new forms of intelligence in other living systems. Since intelligence implies the possibility of communication, the implication is that we might do well to research CDPs in tandem with new forms of intelligence *and* non-local effects, with an eye toward refining and creating new techniques for catalyzing change and/or transformation within other systems that might be useful and beneficial to humanity.

The suggestion that CDP micro-plasmas are associated with changes in molecular clustering leads us to ask, "Are the free energies of the plasma system being converted into bond energies that shape a plant and its stem, leaves, or seeds...or a human and its kidneys, heart, or toes? Is there a common or characteristic order to the matrix of plasma fields associated with a given plant or form?" Could a map of these micro-plasmas be created, thus allowing us to selectively influence the growth and development of the plant? Or perhaps re-create the plant by learning to generate the correct matrix of plasma fields?

Other questions yet to be answered include, Are the free energies of the plasma system being converted into directionally-focused energies? And reciprocally, what role might directionally-focused energies play in the ordering of plasma fields associated with living systems?

These questions point the way for further research.

In the lab, ongoing water studies showed that CDP levels reacted readily to external stimuli that were both local and global in nature, and then returned to their original state when the stimuli ended or were withdrawn. This suggests that living systems are more than just homeostatic; they have broad communication properties and self-sustaining capacities that reach deeply into levels far more subtle than previously thought, and which it would behoove us to investigate and learn from.

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