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ENERGY DEVELOPMENT FROM ELEMENTAL TRANSMUTATIONS IN BIOLOGICAL SYSTEMS

by
S. Goldfein

May 1978

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The purpose of the study was to determine whether recent disclosures of elemental transmutations occurring in biological entities have revealed new possible sources of energy. The works of Kervran, Komaki, and others were surveyed; and it was concluded that, granted the existence of such transmutations (Na to Mg, K to Ca, and Mn to Fe), then a net surplus of energy was also produced. A proposed mechanism was described in which Mg adenosine triphosphate, located in the mitochondrion of the cell, played a double role as an energy producer. In addition to the widely accepted biochemical role of MgATP in which it produces energy as it disintegrates part

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by part, MgATP can also be considered to be a cyclotron on a molecular scale. The MgATP when placed in layers one atop the other has all the attributes of a cyclotron in accordance with the requirements set forth by E. O. Lawrence, inventor of the cyclotron.

It was concluded that elemental transmutations were indeed occurring in life organisms and were probably accompanied by a net energy gain.

PREFACE

The work described in this report was authorized and funded by the U.S. Army Mobility Equipment Research and Development Command, Material Technology Laboratory, under Project MTL 01901, PMMR-26.

Solomon Goldfein was the principal investigator for the effort. The work was under the direction of Emil J. York, Chief, Material Technology Laboratory.

Robert C. McMillan, Chief, Radiation Research Group, provided guidance with regard to matters relating to physics and nuclear physics aspects.

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ENERGY DEVELOPMENT FROM ELEMENTAL TRANSMUTATIONS IN BIOLOGICAL SYSTEMS

I. INTRODUCTION

1. **Subject.** The object of this study was to determine whether recent disclosures of elemental transmutations occurring in biological entities have revealed new possible sources of energy.

2. **Background.** Two investigators, Kervran and Komaki,[1] [2] have been recently nominated for a joint Nobel prize for their work involving the experimental proof that elemental transmutations were occurring in life organisms. Elements which were definitely proven to have been transformed were sodium (to magnesium), potassium (to calcium), and manganese (to iron). Actually, observations have been made for almost 200 years that elemental mutations were occurring, but little credence was given to them because they resembled alchemy – a relic of the middle ages.

From Jueneman,[3] investigations on transmutations can be traced from 1799 to the present.

The French Chemist, Vauquelin, in 1799, observed a large quantity of lime in the daily excretion of hens. To determine where the lime was coming from, he fed a captive hen a diet of nothing but oats. He measured the amount of lime in the oats, fed the oats to the hen, and then measured the amount of lime in the excretion and the eggs of the hen. The lime had increased fivefold. Vauquelin realized that lime had been created but he did not know why.

In 1822, Prout, an English experimenter, defined the transmutation of elements by studying incubating chicken eggs. He observed increasing amounts of calcium carbonate inside the egg and determined that the compound did not come from the shell.

In 1831, Choubard experimented with germinating watercress seeds. He observed new minerals in the young plants that were not present in the original seeds.

In 1844, Vogel also worked with watercress seeds. He placed his seeds in a controlled-air environment and added a sulfur-free nutritive solution to the seeds. The plants that grew from the seeds were found to have more sulfur than the original seeds.

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[1] C. L. Kervran, *Prev. en Biologie de Transmutation a Faible Energy*, Malorinx, Paris (1975).

[2] H. Komaki, *Rev. de Pathologie Comparee*, *67*, 213 (1967); *69*, 29 (1969).

[3] F. B. Jueneman, "The Transmutation of Species," *Industrial Research*, *19*, No. 13, 11 (Dec 1977).

Vogel's answer was that sulfur was not a simple element or that sulfur was introduced from sources unknown.

After Vogel, Lauwes and Gilbert observed the weight variation of ashes during vegetation. In particular, they found a variation in magnesium.

In 1875, Von Herzeele also studied vegetating plants and discovered a weight increase in the ashes of the young plants.

Later, following the works of Vogel and Lauwes and Gilbert, Von Herzeele considered the variation in the weight of magnesium. He concluded that a transmutation of elements had taken place.

In 1960, Baranger, of France, published his findings on variations of calcium and phosphorus in germinating seeds. He also concluded that a transmutation had taken place, but he did not determine the reason.

In the early sixties, Louis Kervran's discoveries on transmutations were published by a French scientific review. Kervran demonstrated that not only molecules but also atoms could be transformed, and he verified the transmutation of matter from atom to atom.[4]

Komaki reported that eight strains of microorganisms grown in K-deficient culture media increase the total K by converting Ca to K – a fission reaction. A theoretical basis for Kervran's result has been discussed by de Beauregard.[5]

Working at the Ecole Polytechnique in Paris, Baranger, who also headed the organic laboratory, determined that transmutations were indeed taking place. Yet, none of these latter-day alchemists could propose a theory for the mechanism of such an unlikely appearing event as biological transmutation.

Summarizing, disclosures have been made of transmutations in microorganisms, plants, and animals. Some have been fusion while others have been fission phenomena.

II. INVESTIGATION

3. Plan. In the search for clues to the possibilities for energy development, calculations were made to determine whether there was a net weight loss during the

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[4] F. B. Jueneman, "The Transmutation of Species," *Industrial Research, 19*, No. 13, 11 (Dec 1977).

[5] O. Costa de Beauregard, *Proc. 3rd Int. Cong. Psych.* (Tokyo), *168* (June 1967).

transmutations. This was followed by an examination of the most likely place for the event to occur and the presence there of the same elements disclosed to have undergone nuclear changes. A study then followed to determine if a mechanism was present which might cause such nuclear transmutations in accordance with presently accepted nuclear theory.

a. **Net Weight Change.** The study was limited to fusion reactions so that the difference in atomic number would be only one. These included Na, K, and Mn:

Sodium to magnesium where:

$$\text{Na} + \text{H}^{+} \longrightarrow \text{Mg}$$

Potassium to calcium where:

$$\text{K} + \text{H} \longrightarrow \text{Ca}$$

Magnesium to iron where:

$$\text{Mn} + \text{H} \longrightarrow \text{Fe}$$

The atomic weight differences were:

$${}^{23}_{11}\text{Na} + {}^{1}_{1}\text{H}^{+} \longrightarrow {}^{24}_{12}\text{Mg}$$

22.989 770 7	1.007 825 19	23.997 595 89
	true atomic weight	23.989 770 7
	loss of mass	0.007 825 19

$${}^{39}_{19}\text{K} + {}^{1}_{1}\text{H}^{+} \longrightarrow {}^{40}_{20}\text{Ca}$$

38.963 710 1	1.007 825 19	39.971 535 29
	true atomic weight	39.962 558 9
	loss of mass	0.008 976 39

$${}^{55}_{25}\text{Mn} + {}^{1}_{1}\text{H}^{+} \longrightarrow {}^{56}_{26}\text{Fe}$$

54.938 050 30	1.007 825 19	55.945 875 49
	true atomic weight	55.934 936 3
	loss of mass	0.010 939 19

Energy developed as a result of transmutation:

Conversion factor for atomic mass unit (amu) = 931 $\frac{\text{MeV}}{\text{amu}}$

Na → Mg	0.077 825 19 (931)	(7.29 MeV)
K → Ca	0.008 976 39 (931)	(+8.35 MeV)
Mn → Fe	0.010 030 10 (931)	(+10.18 MeV)

b. **Energy Required for Nuclear Reactions.** No information has been discovered as to the energy required for these reactions to occur and, thus, whether there would be a net gain of energy. As far back as 1932, however, it was known that alpha particles having energies when ejected from radioactive elements of medium life of between 5 and 7 MeV could cause atomic disintegrations. Cockcroft and Walton built a tall, vertical tube capable of evacuation with a filament producing electrons at the top and a target of the element to be bombarded at the bottom. A low pressure of hydrogen was introduced and ionized by collisions with the electrons produced by the filament. The top of the tube could be raised to a high positive potential, up to 700,000 volts, the bottom being at earth. On reaching the bottom of the tube, the protons had a kinetic energy equal in electron-volts to the potential in volts at the top of the tube. Using a lithium target, at 45° to the bombarding protons, disintegrations of some of the lithium atoms into pairs of helium nuclei ejected almost in opposite directions were observed with only 120,000 volts.[6]

The reaction is:

H + Li → He + He.

Another such pertinent reaction was:

F + H → 0 + He.

c. **Probable Location of Energy Development.** The mitochondrion, a cylindrically shaped organelle, is universally recognized as the primary site for energy production in all life organisms regardless of whether they are one-celled bacteria, plants, or animals.[7] Some cells have as many as 7000 mitochondria (Figure 1). The

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[6] J. Cockcroft and B. Lewis, *Proc. Roy. Soc. A, 136*, 619: *137*, 229 (1932), *154*, 246, 26 (1936).

[7] Henry R. Makler and Eugene H. Cordes, *Biological Chemistry VI* 601, 609, 618 (1966).

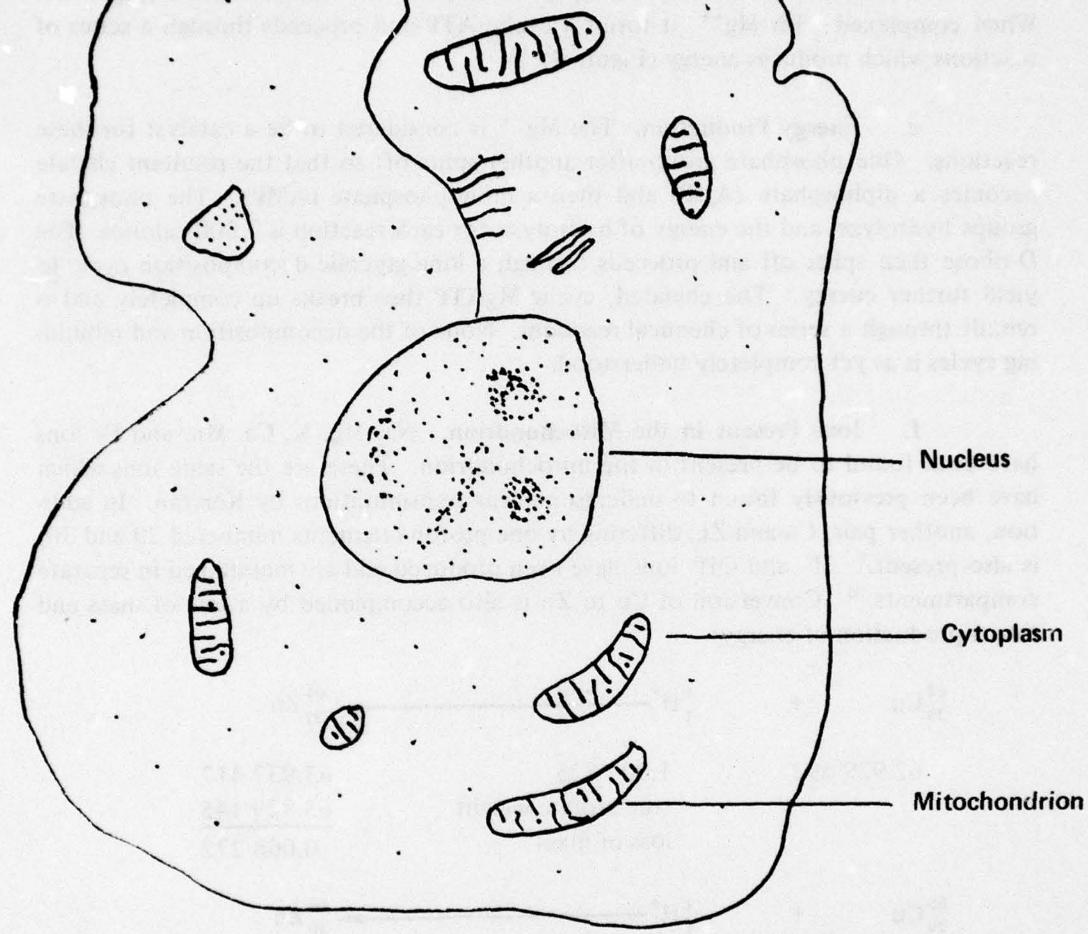

Figure 1. Typical cell showing a number of mitochondria.

mitochondrion is divided into compartments in which various reactions take place (Figure 2).[8]

d. **Chemicals Involved.** Adenosine triphosphate (ATP) is now recognized as the molecule most involved in energy production in the mitochondrion (Figure 3). When complexed with Mg^{++}, it forms a cyclic ATP and proceeds through a series of reactions which produces energy (Figure 4).

e. **Energy Production.** The Mg^{++} is considered to be a catalyst for these reactions. One phosphate group after another splits off so that the resultant chelate becomes a diphosphate (ADP) and then a monophosphate (AMP). The phosphate groups hydrolyze, and the energy of hydrolysis for each reaction is 7,500 calories. The D-ribose then splits off and proceeds through a long glycolic decomposition cycle to yield further energy. The chelated, cyclic MgATP thus breaks up completely and is rebuilt through a series of chemical reactions. None of the decomposition and rebuilding cycles is as yet completely understood.

f. **Ions Present in the Mitochondrion.** Na, Mg, K, Ca, Mn, and Fe ions have been found to be present in the mitochondrion. These are the same ions which have been previously found to undergo nuclear transmutations by Kervran. In addition, another pair, Cu and Zn, differing by one proton (elements numbered 29 and 30) is also present.[9] H^+ and OH^- ions have been produced and are maintained in separate compartments.[10] Conversion of Cu to Zn is also accompanied by a loss of mass and thus a production of energy:

$${}^{63}_{29}\text{Cu} \quad + \quad {}^{1}_{1}\text{H}^{+} \longrightarrow {}^{64}_{30}\text{Zn}$$

62.929 592	1.007 825	63.937 417
	true atomic weight	63.929 145
	loss of mass	0.008 272

$${}^{65}_{29}\text{Cu} \quad + \quad {}^{1}_{1}\text{H}^{+} \longrightarrow {}^{66}_{30}\text{Zn}$$

64.927 786	1.007 825	65.935 611
	true atomic weight	65.926 052
	loss of mass	0.009 559

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[8] Henry R. Makler and Eugene H. Cordes, *Biological Chemistry*, *VI* 601, 609, 618 (1966).

[9] *Ibid.*

[10] *Ibid.*, p. 609, note 1.

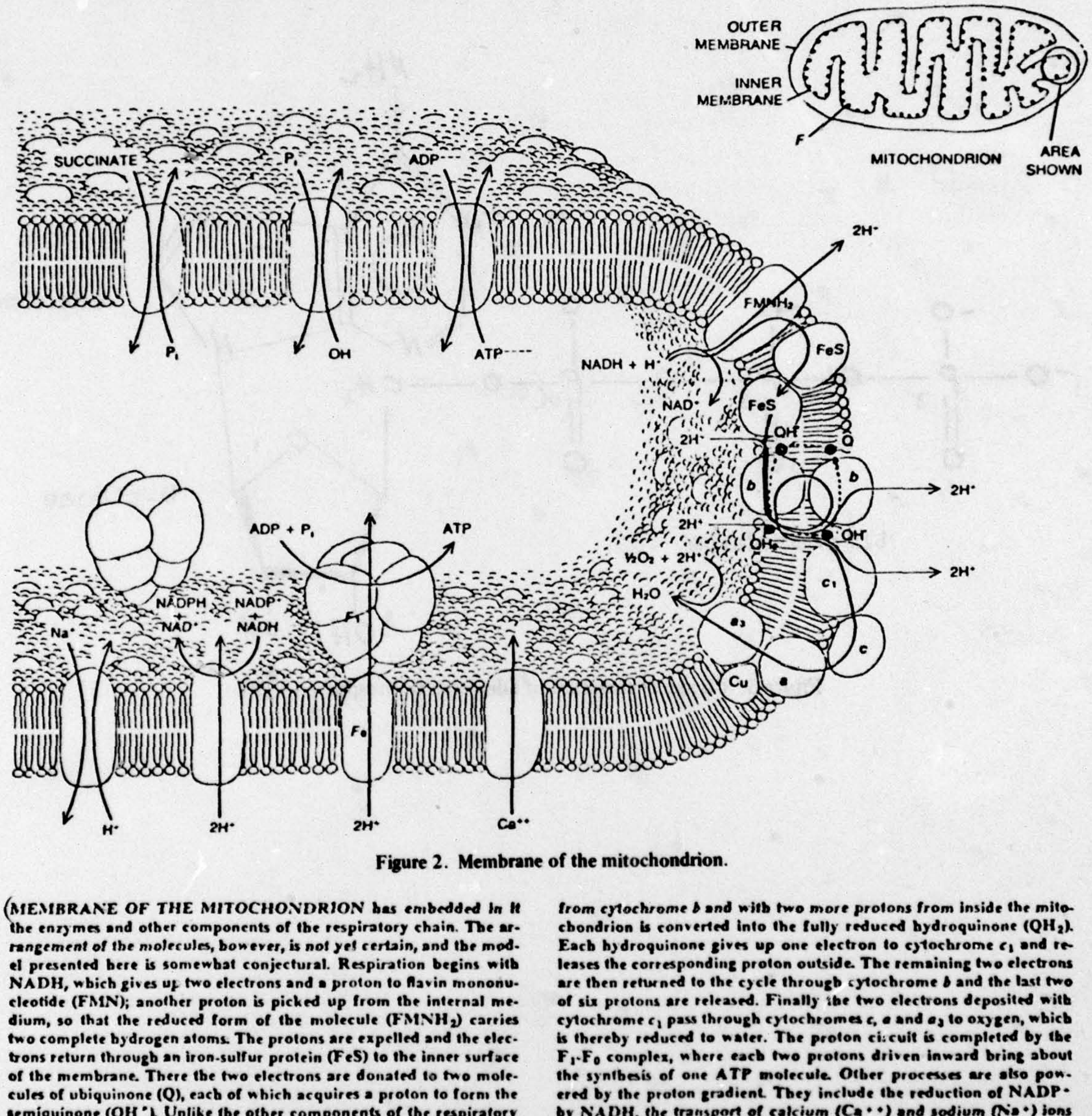
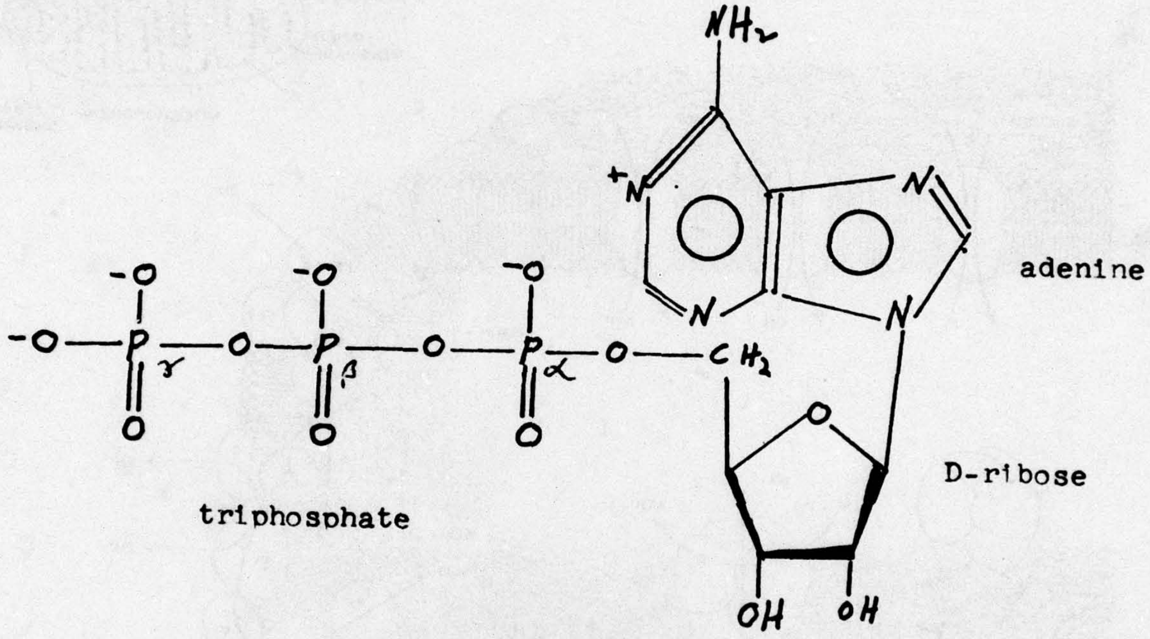


Figure 2. Membrane of the mitochondrion.

(MEMBRANE OF THE MITOCHONDRION has *embedded in it* the enzymes and other components of the respiratory chain. The arrangement of the molecules, however, is not yet certain, and the model presented here is somewhat conjectural. Respiration begins with NADH, which gives up two electrons and a proton to flavin mononucleotide (FMN); another proton is picked up from the internal medium, so that the reduced form of the molecule ($FMNH_2$) carries two complete hydrogen atoms. The protons are expelled and the electrons return through an iron-sulfur protein (FeS) to the inner surface of the membrane. There the two electrons are donated to two molecules of ubiquinone (Q), each of which acquires a proton to form the semiquinone ($QH^\bullet$). Unlike the other components of the respiratory chain the quinones probably migrate as molecules through the membrane (*broken lines*). The semiquinone takes *on two more electrons from cytochrome b* and with two *more* protons from inside the mitochondrion is converted into the fully reduced hydroquinone (QH_2). Each hydroquinone gives up one electron to cytochrome c_1 and releases the corresponding proton outside. The remaining two electrons are then returned to the cycle through cytochrome *b* and the last two of six protons are released. Finally the two electrons deposited with cytochrome c_1 pass through cytochromes *c*, *a* and a_3 to oxygen, which is thereby reduced to water. The proton circuit is completed by the F_1-F_0 complex, where each two protons driven inward bring about the synthesis of one ATP molecule. Other processes are also powered by the proton gradient. They include the reduction of $NADP^+$ by NADH, *the transport of calcium* (Ca^{++}) *and sodium* (Na^+) ions and the exchange of ADP for ATP. The illustrations on this page and the *next two pages* are based on drawings made by Maija V. Hinkle.)

(Permission to use this figure from an article "How Cells Make ATP," *Scientific American 104* (March 1978), has been granted by the authors, Peter C. Hinkle and Richard E. McCarty.)



Fiture 3. Chemical structure of adenisine triphosphate (ATP).

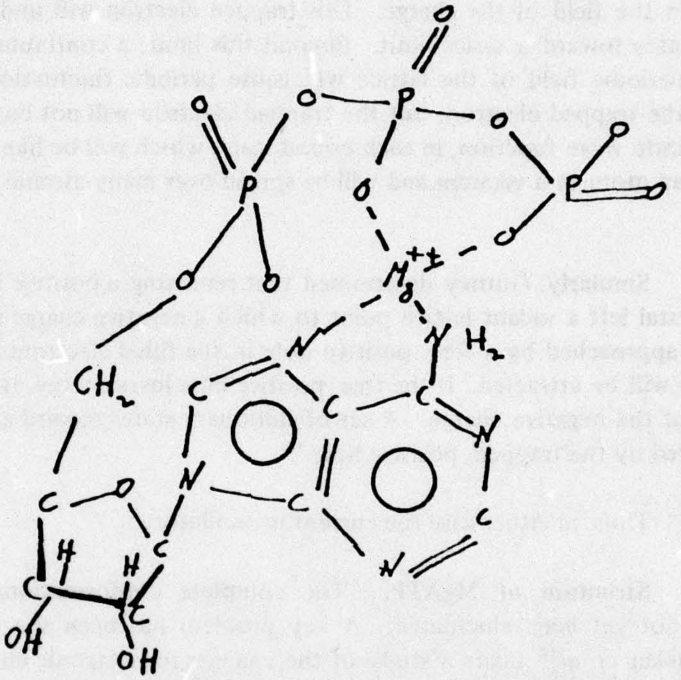


Figure 4. Chemical structure of adenosine triphosphate chelated with magnesium ion. (MgATP)

g. Current Flow. The net result of the many reactions occurring in the mitochondrion is a flow of electrons.[11] This flow is oscillatory in the MgATP crystal.

Gurney determined that removing a negative ion from the interior of a perfect crystal left a vacant lattice point to which a positive charge is associated. If this point is approached by a free electron in the conduction band, the electron will be attracted as from a positive-charged particle. Thus, if the electron loses energy, it may be trapped in the field of the charge. This trapped electron will undergo a series of stationary states toward a series limit. Beyond this limit, a continuum of states will exist. The periodic field of the lattice will cause periodic fluctuations on the wave function of the trapped electron, but the trapped electron will not be prevented from having a definite wave function, in each bound state, which will be like that of an electron within an atom in a vacuum and will be spread over many atomic distances in the crystal.[12]

Similarly, Gurney determined that removing a positive ion from within a perfect crystal left a vacant lattice point to which a negative charge is associated. If this point is approached by a free, positive hole in the filled electronic band, the free, positive hole will be attracted. If the free, positive hole loses energy, it will be trapped in the field of the negative charge. A set of stationary states toward a series limit will be encountered by the trapped, positive hole.[13]

Thus, in either case the current is oscillatory.

h. Structure of MgATP. The complete conformational structure of MgATP has not yet been elucidated. A key problem has been the function of the Mg^{++}. Kothekar *et. al*[14] made a study of the changes in electronic charge and energy distribution in ATP and ADP after incorporation of Mg^{++}. They hypothesized that even though Mg^{++} is not absolutely essential for enzymatic action, its presence facilitates the action by modifying the charge distribution. The most likely position of Mg^{++} is symmetrical between the three P atoms. Binding between Mg^{++} and ATP was considered mostly ionic in nature. No detailed, acceptable information is yet available regarding the crystalline structure of MgATP.[15]

4. Proposed Alternate Mechanism for Energy Production. There is hardly a material in life organisms which performs only a single function. Therefore, MgATP

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[11] Peter C. Hinkle and Richard E. McCarty, "How Cells Make ATP," *Scientific American 104* (March 1978).

[12] R. W. Gurney, "Ionic Crystals," *Handbook of Physics*, ed. Condon and Odishaw, 2nd edition, 8-49, Section 12 (1967).

[13] *Ibid.*

[14] V. Kothekar, R. S. Tyagi, and R. K. Mishra, "Molecular Orbital Calculations of Magnesium Complexes with ATP and ADP," *Indian. J. Biochem and Biophysics*, 10 (4), 279-82 (1973).

[15] O. Kennard, *et. al*, "The Crystal and Molecular Structure of Adonosine Triphosphate," *Proc. R. Soc. London, A325*, 401-436 (1971).

was examined for an additional and alternate means of energy production which would encompass nuclear fusion reactions in accordance with recognized nuclear theory and practice. The principal method of producing nuclear reactions is by an accelerator – either linear or cyclic. E. O. Lawrence in the 1930s used the cyclotron resonance phenomenon as the basis for the cyclotron particle accelerator. He derived the equations of motion for a charged particle in a uniform, magnetic field with a constant period of revolution so that particles can be accelerated indefinitely in resonance with an oscillatory electric field. Recently, Hunter and McIlver developed a small spectroscope based on this principle.[16]

In view of the lack of information regarding the crystalline structure of MgATP or its structure with regard to adjacent molecules of MgATP, it is hypothesized that the molecules of MgATP are situated one above the other, so located that the Mg^{++} forms a continuous chain. With the exception of the D-ribose unit, the complex or chelate lies in a plane. The D-ribose folds up – a phenomenon called sugar puckering.[17] Since the D-ribose molecules might interfere with each other under these conditions, the MgATP has been rotated so that the D-ribose units would lie 180° apart. A top view of the two molecules is shown in Figure 5. Since the P groups are equidistant from the Mg^{++}, it follows that they may be 60° apart around a circle whose center is the Mg^{++}. The acyl oxygen dipoles attached to the P atoms would likewise be situated around the circumference of the circle 60° equidistant. There is evidence that the dipoles might be situated 30° around the circumference in which case four molecules of MgATP would be required for twelve dipoles to be present in the circle.[18] Figures 6 and 7 show top and side views respectively of such an arrangement. The phosphate chain is in the folded configuration and not extended as in anhydrous, inorganic triphosphates. It would form a helix, and torsion angles about the bonds have been calculated.[19] The net effect would be that the H^+ would make a helical path which would be circular as shown in Figure 7.

Dipoles have been found to be energized by unsaturation in the ionic structure – binding with metal ions with each dipole presumably requiring, on the average, one unsaturation or double bond.[20] Hughes and Rideal showed that a dipole is induced in a double bond if it is situated in the α position but not if it is further away.[21] In contrast, the presence of a double bond in the 4-5 carbon position of

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[16] Richard L. Hunter and Robert T. McIlver, Jr. "Rapid Scan Ion Cyclotron Resonance Spectroscopy," American Laboratory, *9*, No. 11, 13 (1978).

[17] O. Kennard, *et. al*, "The Crystal and Molecular Structure of Adenosine Triphosphate," *Proc. R. Soc. London, A325*, 401-436 (1971).

[18] *Ibid.*

[19] *Ibid.*

[20] O. Dinesh Shah and Jack H. Schulman, *Advanced Chemical Series 84*, 189 (1967).

[21] A. Hughes and E. K. Rideal, *Proc. Roy. Soc. London, A140*, 253 (1933).

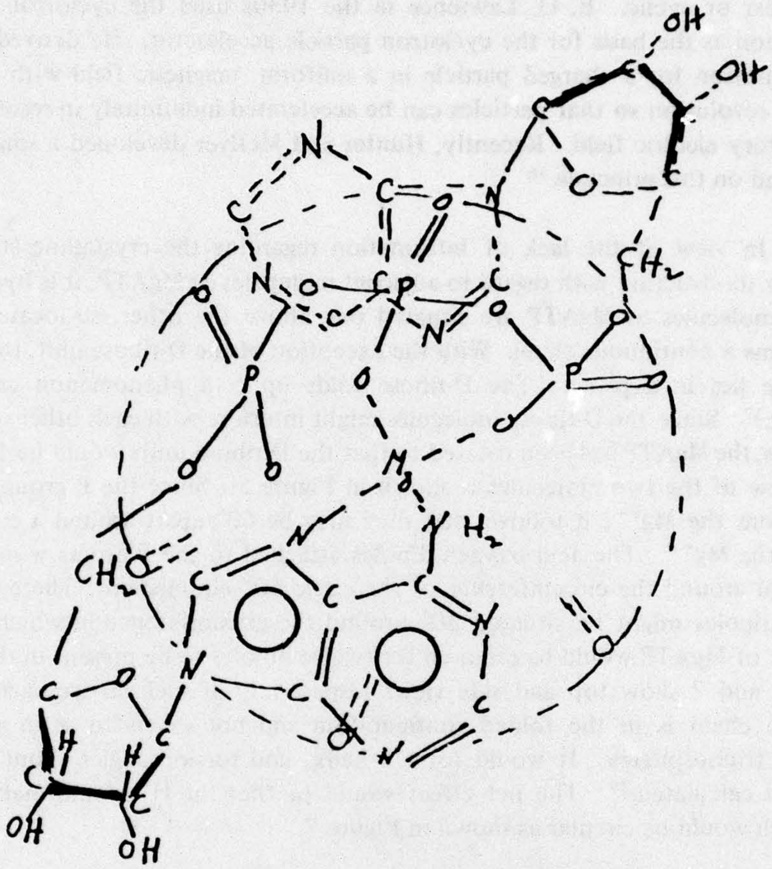

Figure 5. Planar view of two molecules of Mg chelated ATP one directly above the other facing each other. The dashed-line structure represents the lower molecule. The Mg^{++} is at the center of a circle with six dipoles spaced evenly around the circumference – three per molecule of ATP. The adenine part of the adenosine triphosphate straddles the perimeter.

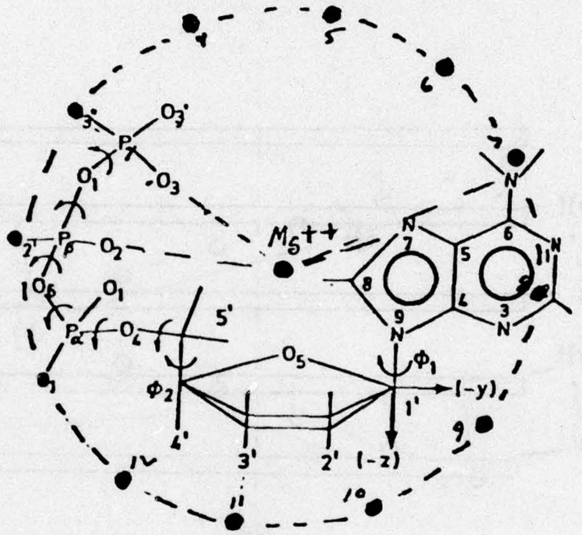

Figure 6. Planar view of four MgATP molecules showing twelve dipoles and only one Mg^{++} and adenosine molecule. Arrows show α, β, γ rotation of P atoms and, hence, dipoles 1, 2, and 3 when not chelated. Chelation prevents rotation of P atoms and could result in forcing dipoles out of the plane.

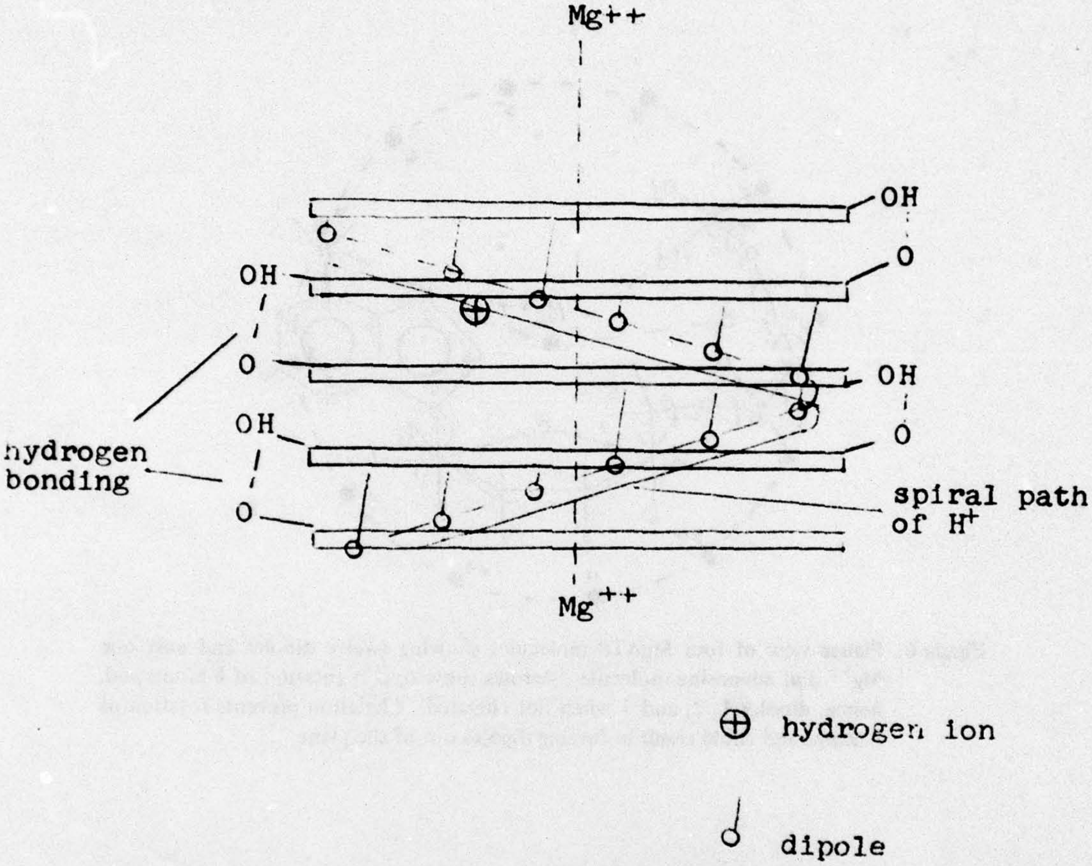

Figure 7. Side view of four molecules of MgATP. Possible hydrogen bonding between OH of D-ribose and gamma oxygen is shown.

sphingomyelin increases the surface dipole and, hence, the surface potential of the monolayer.[22] No evidence exists, therefore, for a maximum-distance limitation. In this case, the unsaturation in the adenine molecule comprising four double bonds should, therefore, be sufficient to energize the three dipoles in the phosphate groups. The current formed by the electron flowing in an oscillatory fashion from one Mg^{++} to another must of necessity be accompanied by an oscillatory magnetic field. This could easily extend out to the perimeter and accelerate the H^+ to relativistic speeds. It would be guided in its path by the dipoles.

An interesting feature noticed in Figure 5 is the location of the adenine rings in the adenosine heterocycles. They sit directly on the circumference or perimeter of the circle formed by the acyl oxygen dipoles and 180° apart from each other. When a conjugated ring molecule is placed in a magnetic field, its electrons are caused to circulate and, in circulating, they generate secondary magnetic fields, i.e., induced magnetic fields. The ring is fully conjugated and, hence, has a rotating ring current only when exposed to a magnetic field.[23] Because of the puckering effect of the D-ribose, the ring slopes and skews downward toward the perimeter. Its induced magnetic field, thus, has a tangential component capable of exerting an accelerating force on the H^+ as it passes by.

Each requirement for a cyclotron particle accelerator has been met on a molecular scale as follows.

a. **Oscillatory Electric Field.** There is a continuous flow of electrons in the mitochondrion. The current oscillates as it flows through the chain of Mg^{++}s. The electric field accompanying the current oscillates in unison with it.

b. **Presence of Hydrogen Ions.** Hydrogen ions are present in one of the compartments of the mitochondrion.

c. **Auxiliary Control and Propulsion of H^+ by Dipoles.** An H^+ introduced between the components of the sandwich would be attracted by an energized dipole and passed from one dipole to another around a helical circle having a diameter of approximately 30 Angstroms.

d. **Induction of Ring Current in Adenine.** The oscillating electric field induces an oscillating ring current in the adenine ring of the molecule.

e. **Effect of Magnetic Field on Hydrogen Ion.** As the H^+ passes under the ring, it is attracted by the magnetic field accompanying the ring current and accelerated

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[22] O. Dinesh Shah and Jack H. Schulman, *Lipids 2*, 21 (1967).

[23] R. T. Morrison and R. N. Boyd, *Organic Chemistry*, 3rd Edition, 419 (1973).

to a very high speed. The H^+ soon approaches relativistic speeds because the ring current also is probably rotating at such speeds.

f. Circular Helical Path of Hydrogen Ion. In a crystal having four molecules of MgATP, the path of the H^+ is a circular helix. As many molecules of MgATP as are necessary would be present to accelerate the H^+ and impart sufficient energy to it to penetrate the nucleus of an atom and convert it to an atom of the next higher number.

III. DISCUSSION

5. General. There were numerous evidences that the premise upon which the study was based was true, i.e., that nuclear transmutations were indeed taking place in life organisms of all types. It was shown that there was a net loss in mass for the transmutations of Na, K, and Mn to Mg, Ca, and Fe respectively. These represented energies in the range of 8.35 MeV to 11.69 MeV. Although there was no information regarding the energy cost in effecting the transmutations, similar transmutations involving hydrogen ions were much less. Thus, there probably was a net gain in energy during the atomic transmutations.

The mitochondrion, well known as the location for energy production in the cell, was closely examined for clues as to the possibility of elemental transmutations also occurring there. The presence of the ion pairs (Na, Mg), (K, Ca), and (Mn, Fe) in the mitochondrion gave strong support to such a conjecture. Moreover, the additional pair (Cu, Zn) found there but not reported by Kervran or others provided added support. These were the only ions reported to have been found in the mitochondrion.

Adenosine triphosphate (ATP) in its chelated form with Mg as MgATP has been pinpointed as the source of energy in the mitochondrion. An examination of its structure indicated that when the molecules are placed one on top of another with the Mg^{++} in the center, the group resembled a working model of a cyclotron on a molecular scale. When MgATP is taken apart, its components can be burned to also form energy. An analogy would be a windmill or waterwheel made of wood. Both can harness the elements to produce mechanical or electrical energy. When they are taken apart and burned, the components produce thermal energy.

The question of the primary purpose of the transmutations is of considerable interest. From Komaki's work, it would appear that transmutations were used to maintain a balance of certain elements. In the human body, it is evident that health would be considerably impaired if it were attempted to obtain energy continuously from such transmutations. The body can tolerate just so much Na, K, Mg, Ca, etc., and the quantities are small.

No reports have been found of experiments which were made in which energy was measured along with elemental transmutation. Such experiments would be relatively simple to design and perform. The relatively available huge supplies of the elements which have been reported to have been transmuted and the probable large accompanying energy surplus indicate a new source of energy may be in the offing – one whose supply would be unlimited.

IV. CONCLUSIONS

6. **Conclusions.** It is concluded that elemental transmutations occurring in life organisms are accompanied by losses in mass representing conversion to thermal energy and that such energy probably is a net gain when compared to the amount required to effect the transmutation.

REFERENCES

Cockcroft, J. and Lewis, B., *Proc. Roy. Soc. A136,* 319; 137, 229 (1932), *154,* 246, 26 (1936).

de Beauregard, *O.* Costa, *Proc. 3rd Int. Cong. Psych (Tokyo), 168* (June 1977).

Gurney, R. W., "Ionic Crystals," *Handbook of Physics,* Edited by Condon and Odishaw, 2nd Edition, 8-49, Section 12 (1967).

Hinkle, Peter C. and McCarty, Richard E., "How Cells Make ATP," *Scientific American 104* (March 1978).

Hughes, A. and Rideal, E. K., *Proc. Roy, Soc. London, A140,* 253 (1933).

Hunter, Richard L. and McIlver, Robert T., Jr., "Rapid Scan Ion Cyclotron Resonance Spectroscopy," American Laboratory *V9,* No. 11, 13 (1978).

Jueneman, F. B., "The Transmutation of Species," *Industrial Research, V 19,* No. 13, 11 (Dec 1977).

Kennard, O. *et. al,* "The Crystal and Molecular Structure of Adenosine Triphosphate," *Proc. R. Soc. London A325,* 401-436 (1971).

Kervran, C. L., *Prev. en Biologie de Transmutation a Faible Energy,* Malorinx, Paris (1975).

Komaki, H., *Rev. de Pathologie Comparee, 67,* 213 (1967); *69.* 29 (1969).

Kothekar, V., Tyagi, R. S., and Mishra, R. K., "Molecular Orbital Calculations of Magnesium Complexes with ATP and ADP," *Indian J. Biochem and Biophysics, 10 (4),* 279-82 (1973).

Makler, Henry R. and Cordes, Eugene H., *Biological Chemistry, V1,* 601, 609, 618 (1966).

Morrison, R. T. and Boyd, R. N., *Organic Chemistry,* 3rd Edition, 419 (1973).

Shah, O. Dinesh and Schulman, Jack, *Advanced Chemical Series, 84,* 189 (1967).

Shah, O. Dinesh and Schulman, Jack, H., *Lipids, 2,* 21 (1967).

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