

A Report on the Development of the Principle of Dynamic

Contrabarie

by Burkhard Heim

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Preliminary Remark

In the present informatory report I am able to give only a schematic review of the results of my theoretical investigations, without entering into the details of the new analytical methods. Such a detailed discussion would require more time than the scope of the present small paper permits.

Introduction

A careful study of all the fields of natural science known today leads to the conclusion that there are various profound gaps in the world-picture of our scientific knowledge. The phenomena of the material world may be perfectly well approached with the current mathematical-physical methods, but even within this physical perception, which applies to inorganic matter, such a gap becomes apparent, for our contemporary physical knowledge culminates evidently in two inclusive theories, namely in the general theory of relativity and in the quantum theory.

Both theories describe very well the material reality within their fields of application, yet they appear to be mutually exclusive in their principles. Apart from the material processes accessible to a mathematical-physical approach there are also the vital processes involving material occurrences, whose elementary process can not be understood on a mathematical-physical basis, even though this process is linked with material happenings. The biological method of discourse fails, in turn, when one is dealing with the problem of understanding psychic processes that involve the vital function. Thus it is not even possible to comprehend, e.g. a series of psychopathological phenomena (such as certain varieties of neuroses, some psychotic structures etc.) on a primarily organic basis. If the existence of parapsychological phenomena actually be confirmed, then the description of them would in any case be alien to the genus of psychology, and would be, psychologically, scarcely comprehensible. Be that as it may,

in any case the methods of description mentioned, all of which are intended to contribute to the understanding of the relationships between the phenomena of reality, constitute antagonisms which are, to a greater or lesser degree, mutually exclusive, in spite of the fact that all the phenomena considered belong to one and the same world of reality.

The evolution of physical knowledge (that is, the broadening of anthropomorphic empiricism into general theories) has already shown that material reality is an abstraction; i.e. that this reality can not, fundamentally, be grasped by human senses. In view of the above-mentioned antagonisms, to which the gaps in the scientific world-picture are due, I came to the conviction that the method of thought of the human intellect is not adequate for a unified description of reality. The antagonisms are not, in my opinion, the result of the lack of further empirical facts, but are antagonistic in principle, and this inadequacy is based on the nature of the human intellectual process. The nature of this intellectual process is based on an anthropomorphic, contradictory logic, of which mathematical analysis is only an aspect. Further, this anthropomorphic form is not the only possible one, but merely an expression of the structure of the specifically anthropomorphic intellect, so that it seemed rational to me to develop a completely new analytical method, which is an abstraction from the typical method of contradiction. I perfected this new method (designated by me as "syntrometry") to the point where it was possible to derive general principles and criteria. Then I examined the transition which takes place when this method is related to the special aspect of mathematical analysis, and I saw that the elements of this analysis prove to be a special case, one of an unlimited number of possible aspects. At the same time criteria were thus set up to expand syntrometrically a precisely formulated mathematical state of affairs, and thus the possibility was created of applying these methods also to mathematically formulated laws of nature. For this purpose I used ^{empirically} well-founded ^(assertions) statements of mathematical physics

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(e.g. the principle of [conservation of?] energy, the second law of thermodynamics, etc.).

The laws of nature that are in this way put into syntrometrical form form an extremely abstract system of of statements, to which general criteria can be applied, but can not be made visualizable in any way, and which is also not directly accessible to any direct empirical testing. This is so, because the tendency is rooted in the nature of the human intellect to operate according to a specific method of thought which corresponds to its structure. It is nevertheless possible to establish a relationship with the new method, because we are dealing with an automatized operation with non-anthropomorphic formalisms, an operation that is possible in ^v_Λ anthropomorphic-dialectical concepts.

It is inherent in the character of the new method to induce entire ~~congeries~~ ^{congeries} syndromes of statements, and these syndromes may be individually checked [as to their accuracy?]. In the case of syntrometrically expanded natural laws, to which the general criteria have been applied, the possibility of making the concepts visualizable does exist, as the induced syndromes are related [referred?] to the particular aspect of mathematical analysis^s. In doing so the lower syndromes are reduced to analytical statements that are constantly repeated in the higher syndromes, although these syndromes, before their ^{particularization} specialization [?], were essentially different from the lower ^{level} [kinds/of?] induction. From this it is to be inferred that they contained, before their ^{particularization} specialization, statements not capable of being formulated in mathematical analysis [or: (the text is doubly ambiguous in its grammar) that they contained statements incapable of being formulated, before their ^{particularized} specialized application to mathematical analysis]. A closer examination of this result shows that these higher syndromes actually seem to reveal bridges to the elementary life-process and to the psychic structures connected with it. The ^e_Λ results yielded by this for the understanding of biological and psychical problems, as well as those possibly of significance for medical research, we shall not here discuss further.

The Approximative [?] Origin of the Meso-Field Theory

In the above-mentioned ^{particularization} specialization, therefore, the ^{congeries} syndromes of statements are divided into multi-dimensional, non-linear, partial

differential equations (I designate them as meso-field-equations), which are admittedly no longer capable of describing the elementary life-process, but which do represent a universal natural law of material reality.

The reason for this is that the field formulas of the general theory of relativity result from them in the fifth approximation, and - if the approximations are carried out in another direction - [there ^e result from them] in the sixth approximation formalisms analogous to the laws of quantum electrodynamics, and this in such a way that the sum total of contemporary physical knowledge results only after numerous approximations from the meso-field-equations. From this I draw the conclusion - for the moment indirectly - that these field-equations are most probably correct.

The approximations leading to the theory of relativity and to quantum dynamics are not, however, the only possible ones. If the field-equations are correct, then every approximation would have to be the basis of some statement [assertion, evidence?] regarding material reality. And in fact natural laws are still being suggested in this way, laws which have so far remained undiscovered, which describe processes for which plausible explanations are still lacking. Thus, e.g. a connection between ponderomotor (gravitational) [?] and electromagnetic effects is revealed as possible. I mention this connection because, in the first place, it can ^{presumably} be tested by modern technological means (such a test would be an experimental confirmation of the theory), and secondly, because with a positive result of such a program of experimentation completely new technological perspectives would be opened, the extent of which cannot yet be gauged. The meso-field-equations are defined in a six-dimensional continuum, and essentially put into correlation the effects of ω_1 a gravitational field, the effects ω_2 of a material field, and the effects ω_3 of a meso-field, which is at present still hypothetical; it does this by means of seven operators $C(j)$ (the ^{subscript} ~~indication~~ [indexing?] j includes the figures 1 to 7), which [operators] depend only on the metrical properties of the affine [~~?unlimited, unmeasured?~~] continuum. The expansion of the time-space-continuum into a six-dimensional affine multiplicity (a projected expansion is probably possible) and the existence of ω_3 result from the syntometric generalization ^{of subsequent} the ~~the~~ ^{specialization} [application?] to the aspect of mathematical analysis. The reciprocal relationship between ω_2 and ω_3 follows clearly through gravitational operator $C(1)$,

while the coupling of ω_1 and ω_3 is possible only by means of material-field-operators only in a fourfold evaluation [interpretation?]; i.e. there are four material-field-operators $C_{(2)}$, $C_{(3)}$, $C_{(4)}$ and $C_{(5)}$, which, by means of four systems of meso-field-equations, place ω_1 and ω_2 in a reciprocal relationship. Finally, there is another reciprocal

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effect between gravitational effects ω_1 and material [matter,] field effects ω_2 , which is brought about by a twofold evaluation by two meso-field-operators $C_{(6)}$ and $C_{(7)}$. Implicitly [it follows logically?] for all seven systems of meso-field-equations the following equations can be

written: $H_1(C_{(1)}, \omega_2, \omega_3) = 0$ (Gravitational field operator)

$H_k(C_k, \omega_1, \omega_3) = 0$ (Operator for matter fields with $2 \leq k \leq 5$)

$H_l(C_l, \omega_1, \omega_2) = 0$ (Operator for meso fields $l=6$ and $l=7$)

hermitean

eigen values

All $C_{(j)}$ are hermitean [?], and their ~~integral~~ [?] values form point spectra, from which the conclusion may be drawn that they function as state [?] operators of the six-dimensional ^{manifold} multiplicity, and that the field-quanta of the gravitational-, material- and meso fields, as ^(absolute?) integral values of these operators, are quantized [?] structures of the six-dimensional affine ^{manifold} multiplicity, whose operative [effective] forms ω_1, ω_2 and ω_3 are in reciprocal relationships by means of the meso-field-equations $H_j = 0$. If the meso-field-equations $j=6$ and $j=7$ are approximated in such a way that four-dimensional time-space relationships result, and if one limits oneself to the fields of matter F and f , whose world-lines are geodetic zero-lines (i.e. to electromagnetic fields of radiation), then in the ^{limits} ~~limits~~ [?] the approximations apply: $\lim. H_6 = G + \Gamma = 0$; $F = 0$ and $\lim. H_7 = f - D$; $G = 0$ or $G + \Gamma = 0$; F and $f = D$; G_+ , in which 0 results from $C_{(6)}$ and D from $C_{(7)}$. In this G indicates a gravitational ^{vector} leading [?] field, in which a ponderable mass may move on any geodetic world-lines (zero-lines are excluded), and G_+ ^(indication) the symmetrical gravitational field of a ponderable mass which does not need to depend on G , and Γ a gravitational disturbance whose world-line is a geodetic zero-line (gravitational wave). The meso-field states described by C and D (the hypothetical meso-field must, therefore, if it is existent, appear dually) were designated by me as contrabaric and dynabaric states and, correspondingly, $G + \Gamma = 0$; F [was designated?] as a contrabaric [equation] or $f = D$; G_+ as a dynabaric equation. In these relationships it is a question of two operator-equations, and the first operator (the contrabaric state) acts upon such material structures whose world-lines must be geodetic zero-lines, i.e. on electromagnetic waves, and as a result of this action there is produced a gravitational field of acceleration relative to the environment accompanied by the emission of

~~transmission~~
counter-running[?] gravitational waves. The second operator-equation describes practically the reverse process. In it the second operator (the dynabario state) acts upon

a gravitational field whose center, conceived as being in an undisturbed state [?], must lie in the interior of the operator-field. This static field is transformed, under the influence of the operator-field, again into electromagnetic waves (i.e. waves whose world-lines are geodetic zero-lines.). The dynabarcic state can, however, be ^{produced} ~~stimulated~~ [called forth?] only endothermically.

If further approximations are carried on in a pseudo-Euclidian manner and the time coordinates split off from the Euclidean physical space, so that time appears as a parameter, then the contrabarcic effect assumes a form from which it is apparent that this equation must be capable of being tested ^{experimentally} by modern technological means, while the dynabarcic equation can be approached experimentally only when the contrabarcic effect has been empirically demonstrated, and the development of a technologically usable contrabarcic transformer has been completed. For this reason in the following section only the above-mentioned approximation of the contrabarcic equation is to be examined.

The contrabarcic effect

If $\bar{\mathcal{E}} \frac{d\bar{\mathcal{K}}}{dV}$ designates the density of a ponderomotive (i.e. gravitational) force $\bar{\mathcal{K}}$ (V is a three-dimensional volume), and $\bar{M}$ the corresponding approximation of the operator $\mathcal{C}$, and $\bar{\mathcal{E}}$ or $\bar{\mathcal{H}}$ the electric or magnetic field-vector of the electro-magnetic effect $\bar{\mathcal{F}}$, which is spatially approximated to $\bar{\mathcal{E}} \times \bar{\mathcal{H}}$, then the empirically ^{verifiable} ~~testable~~ form of the contrabarcic equation is $\bar{\mathcal{E}} = \bar{M}; \bar{\mathcal{E}} \times \bar{\mathcal{H}}$, wherever the splitting of the contrabarcic field-operator $\bar{M} = \bar{M}; \chi$ into two operators is possible, whose commutator $(\bar{M} \times \chi) = 0$ is identical with the zero operator, so that one may write $\bar{\mathcal{E}} = \chi; (\bar{M}; \bar{\mathcal{E}} \times \bar{\mathcal{H}})$. If $d\bar{\mathcal{F}}$ a surface element of experimental arrangement functioning as a contrabarcic ^{transformation} ~~transformation~~ _{stat}-model (we refer here to that analytical space surface in [on?] which the process of transformation takes place), and if $d\bar{\mathcal{C}}$ is the line-element of a closed curve lying within this surface, a curve enclosing the centerpoint of the surface, then a property applies to χ which is formally analagous to the ^{rotational vector} rotor, namely $\int \chi; () d\bar{\mathcal{F}} = - \oint \bar{\mathcal{C}}; () d\bar{\mathcal{C}}$, where Ω is a new operator arising out of χ , which takes effect on $\bar{M}; \bar{\mathcal{E}} \times \bar{\mathcal{H}}$ in such a way that $+ / \Omega; (\bar{M}; \bar{\mathcal{E}} \times \bar{\mathcal{H}}) / = \dot{\eta}_T$ is actually the electromagnetic achievement density attaining contrabarcic transformation.

power

η_T

If $d\bar{s}$ is a ~~normal~~ transition[?] element $\wedge$ to $d\bar{F}$, then $dV \wedge d\bar{F} d\bar{s}$ is true, and the volume ~~dis~~integration of χ ; $(\underline{M}; \bar{E} \times \bar{H})$ becomes possible in accordance with $\bar{K} = \int \chi; (\underline{M}; \bar{E} \times \bar{H}) dV = \int d\bar{s} \int \chi; (\underline{M}; \bar{E} \times \bar{H}) d\bar{F} = \int \chi; (\underline{M}; \bar{E} \times \bar{H}) d\bar{F} d\bar{s} = \int d\bar{s} \oint \Omega; (\underline{M}; \bar{E} \times \bar{H}) d\sigma$

If further $\bar{b}$ is an acceleration and m_0 the ^{rest} mass-at-rest [?] of the experimental arrangement, then $\bar{K} = m_0 \bar{b}$ and $\chi(\bar{K}, d\bar{s}) = 0$, thus $\bar{K} = \int d\bar{s} \oint \Omega; (\underline{M}; \bar{E} \times \bar{H}) d\sigma$ is true.

If the experimental arrangement carried out as a contrabasic transformer model is constructed in such a way that the radiation $\bar{E} \times \bar{H}$, which is transformed, is brought in from without, then $m_0 = \text{const.}$ remains [?]. Further, on the basis of the construction $\chi(\Omega; (\underline{M}; \bar{E} \times \bar{H}) d\sigma) = 0$ $d\bar{K} =$ [should be equal to, (I think)] 0, i.e. $d\bar{K}$ should be the element of a conic section located in the plane surface $\bar{F}$ of the transformer, a conic section which in the simplest case [form?] of construction may be assumed as the circle of radius r ; and finally, $\chi(\Omega; (\underline{M}; \bar{E} \times \bar{H}) d\sigma) = \dot{\eta}_T$ and r are taken to be independent of each other. If the construction of the experimental arrangement satisfies these requirements, then $\dot{b} = -2\pi \frac{r}{m_0} \int \eta_T d\sigma$ applies [~~is true~~]. Since $r = \text{const.}$ can be fixed [~~determined~~] in the construction, the total time differentiation yields the law $\dot{b} = -2\pi \frac{r}{m_0} \dot{\eta}_T \int b d\sigma$, because $\frac{ds}{dt} = b \cdot dt$. The volume V' of that transform^{ation} element in which the force [?] L_T is transformed is likewise determinable in the construction and cannot be varied while the arrangement is functioning, i.e. $V' = \text{const.}$ with regard to the time t . Also, $\dot{\eta}_T = \frac{dL_T}{dV'} = \frac{L_T}{V'}$, i.e. $\dot{b} = -2\pi \frac{r}{m_0 V'} L_T \int b d\sigma$ can always be attained. If L is the in-radiated [?] ^{power} ~~accomplishment~~ at one's disposal, then $L_T < L$ always applies, as there are always unavoidable losses. At first only a portion of L_K is actually connected into[?] the transformer by L , for the quality $\epsilon_K = 1 - \frac{L_W}{L_K}$ lies in the interval $0 \leq \epsilon_K \leq 1$, and there follows from that $L_K = \frac{L}{1 - \epsilon_K}$ (~~degree of extinction~~). Of L_K , in turn, only a portion $L_W < L_K$ is theoretically transformed, because L_K undergoes inevitable [unavoidable] losses by absorption in the transformer even before transformation. This absorbed ^{power} ~~work~~ [energy?] is $L_K - L_W > 0$, so that $\epsilon_A = 1 - \frac{L_W}{L_K}$ may be defined as the ^{coefficient} ~~degree~~ of extinction. For this degree of extinction the same interval applies as for the degree of quality [?]

of the cutting-in [Einkoppelung?], and one finds $L_W = (1 - \xi_A) L_K$. Finally, there are unavoidable structural defects of the transformer elements to be taken into account, which reduce L_W to the value L_T , which actually does get transformed, because of the degree of quality[?] of the transformer element $c_T = 1 - \frac{L_T}{L_W}$.

Accordingly, one has $L_T = (1 - \epsilon_T)(1 - \epsilon_A)(1 - \epsilon_K)L = \epsilon L$ L,
 if $\epsilon = (1 - \epsilon_T)(1 - \epsilon_K)(1 - \epsilon_A)$ describes the degree of action [effect]
 of the entire transformer model. The temporal progress [extent?] of L
 depends on the experimental conditions and is determined by length of
 time [?] of that intensity of radiation which is introduced into the
 arrangement. This intensity of radiation can therefore always be kept
 constant, $\mathcal{Z} = \xi(t)$ is, on the other hand, in general a time function,
 yet this dependence on time becomes noticeable only during some 10^{-6}
 [sec], because after this period of in-oscillation [?] a stationary
 condition develops, which leaves $\epsilon = \text{const.}$ Thus one generally has, with
 $\lambda(t) = 2\pi \frac{rL}{m_0 v}$, $\epsilon(t)$ the law $\ddot{b} + \lambda(t) \int b dt = 0$, yet λ is a time func-
 tion only during the period of in-oscillation [the period during which
 oscillation gets under way?], a period whose course [extent?] is deter-
 mined by ϵ , i.e. by the constructional characteristics and the struc-
 tural errors of the arrangement (this course $\epsilon(t)$ while $0 \leq t < \tau$, as
 well as the time [period] of in-oscillation τ had best be empirically
 determined). For all later times [periods] $t \geq \tau$, since the stationary
 state has come to exist, λ becomes equal to const. [this seems to me
 the only way to interpret the word plus the $\pm$ sign] with respect to t ,
 and the law $\ddot{b} + \lambda \int b dt = 0$ assumes, through repeated differentiation, the
 integratable form $\ddot{b} + \lambda b = 0$ for $t \geq \tau$ of a homogeneous linear differ-
 ential equation of the third order. The solutions of this stationary
 law are as follows, if $k = \sqrt[3]{\lambda} > 0$ is the positive cube root of $\lambda = \text{const.}$:
 $b_1 = e^{-kt}$ as well as $b_2 = e^{\frac{1}{2}kt} \cos kt \sqrt{3}$ and $b_3 = e^{\frac{1}{2}kt} \sin kt \sqrt{3}$, so
 that the general solution for $t \geq \tau$ is $b(k, t) = \sum_{\ell=1}^3 C_\ell b_\ell$, where the C_ℓ
 indicate integration-constants, whose values can be determined, with
 $t = \tau$, after the conclusion of the period of in-oscillation. If γ_ℓ with
 $1 \leq \ell \leq 3$ are the values $\gamma_1 = b(k, \tau)$, $\gamma_2 = \dot{b}(k, \tau)$ and $\gamma_3 = \ddot{b}(k, \tau)$ the forms
 that result from $\ddot{b} + \lambda(t) \int b dt = 0$ along with [?] $0 \leq t < \tau$ for $\lim_{t \rightarrow \tau}$, then
 $\sum_{\ell=1}^3 C_\ell a_\ell = \gamma$ is true [applies], or $\bar{C} \hat{a} = \gamma$, if $\bar{C} = \sum_{\ell=1}^3 C_\ell$ and $\hat{a} = \sum_{\ell=1}^3 \gamma_\ell$
 with $\bar{C}_\ell = \delta_{\ell, \ell}$ or, as the case may be (Tr. of bzw.) $\bar{\gamma}_\ell \bar{\gamma}_\ell = \delta_{\ell, \ell}$ are
 abstract vectors and $\hat{a} = (a_{\ell, \ell})_3$ is the matrix of coefficients. This non-
 homogeneous system of equations makes possible the determination of the C_ℓ

of the stationary solution, for the elements of $\hat{A}$ result from the b_i
 (stationary solutions) for $t \geq \gamma$. If $y^{(n)} = \frac{d^n y}{dt^n}$, then the $a_{i,l}$ are
 given through $a_{i,l} = b_i^{(l-1)}(K\gamma)$. As all $a_{i,l} \neq 0$, the C_i can thus be traced
 back to the properties dependent on the construction of the transformer
 during the process of in-oscillation $0 \leq t < \gamma$. If the symbol rg
 designates an ^{rank}~~order [degree?]~~ of matrix, and if $\hat{A}$ is the

matrix $\hat{a}$ expanded [increased] with $\tilde{r}$, then it becomes evident that, because of the nature of $\tilde{r}$, $\text{rg } \hat{a} = \text{rg } \hat{A}$ can always be attained, from which it follows that $\bar{O} \hat{a} \leq \tilde{r}$ can be solved. With the abbreviations

$$\alpha a_{1,1} = \begin{vmatrix} a_{1,1} & a_{1,2} \\ \tilde{r}_1 & \tilde{r}_2 \end{vmatrix}, \quad \beta a_{1,1} = \begin{vmatrix} a_{1,1} & a_{1,3} \\ \tilde{r}_1 & \tilde{r}_3 \end{vmatrix}$$

$$A a_{1,1} = \begin{vmatrix} a_{1,1} & a_{2,1} \\ a_{1,2} & a_{2,2} \end{vmatrix}, \quad B a_{1,1} = \begin{vmatrix} a_{1,1} & a_{3,1} \\ a_{1,2} & a_{3,2} \end{vmatrix}$$

$$C a_{1,1} = \begin{vmatrix} a_{1,1} & a_{2,1} \\ a_{1,3} & a_{2,3} \end{vmatrix}, \quad D a_{1,1} = \begin{vmatrix} a_{1,1} & a_{3,1} \\ a_{2,3} & a_{3,3} \end{vmatrix}$$

as well as

$$\theta = \begin{vmatrix} A & C \\ \alpha & \beta \end{vmatrix} \text{ and } \omega = \begin{vmatrix} A & B \\ C & D \end{vmatrix} \text{ there follow for } C_1 \text{ the expressions}$$

$$C_1 = \frac{1}{a_{1,1}} \left[\tilde{r}_1 - \frac{a_{2,1}}{a_{1,1}} (\alpha - B \frac{\theta}{\omega}) - a_{3,1} \frac{\theta}{\omega} \right]$$

$$C_2 = \frac{1}{a_{1,1}} (\alpha - B \frac{\theta}{\omega}) \text{ and } C_3 = \frac{\theta}{\omega} \text{ by means of which } b \text{ is completely}$$

determined. $b(k, t) = C_1 e^{-kt} + e^{\frac{1}{2}kt} (C_2 \cos kt\sqrt{3} + C_3 \sin kt\sqrt{3})$ with $t \geq \tilde{r}$ does not change if the time zero-point is displaced [?], so that

$\underline{t} = t - \tilde{r}$ states the new time scale. $\underline{t} \geq 0$ corresponds to $t \geq \tilde{r}$, so that

$\underline{t} \geq 0$ characterizes the scope of validity [applicability?] of the stationary solution. In this time scale the general solution reads: $b(k, \underline{t}) =$

$$\frac{kt}{2} ? C_1' e^{-kt} + e^{\frac{1}{2}kt} (C_2' \cos kt\sqrt{3} + C_3' \sin kt\sqrt{3}) F \text{ and is composed of}$$

component [?] of dying-out of sound [?] and a periodic component with

an exponential amplitude modulation. The periodic factor $C_2' \cos kt\sqrt{3} +$

$C_3' \sin kt\sqrt{3}$ is a harmonic oscillation which periodically changes its

sign [placed before it], and this change of sign can no longer be com-

pensated ~~for~~ by the component of dying-out of sound for the sufficiently

great $\underline{t}$, so that b also undergoes a periodic change of sign and for this

reason disappears in the means [average?]. $\bar{b} < 0$ means that there can be

no contrabatic effect if the radiation-intensity [?] L is constantly

introduced stationarily without change of intensity, for all contrabatic

effects (used here in sense of what is done contrabarically) must be

compensated in the time mean, because of the periodic change of sign.

There is, however, a time interval $0 \leq \underline{t} \leq \underline{t}_{(0)}$, in which the harmonic

component does not change its sign. Only in the case of $\underline{t} = \underline{t}_{(0)}$ does a

change of sign take place, and at this time-point $e^{\frac{1}{2}kt_{(0)}} (C_2' \cos k \underline{t}_{(0)} \sqrt{3}$

$$+ C_3' \sin k \underline{t}_{(0)} \sqrt{3}) \text{ must } \leq 0. \text{ As}$$

$$F \text{ with } C_i' = C_i' (C_1, C_2, C_3, \tau)$$

in any case $e^{1/2kt_{(0)}}$ is > 0 , $C'_3 \sin kt_{(0)}\sqrt{3}$ must be $-C'_2 \cos kt_{(0)}\sqrt{3}$,

and from this it follows that $t_{(0)} = -\frac{1}{k\sqrt{3}} \tan^{-1} (C'_2 / C'_3)$ or $t_{(0)} =$

$\gamma - \frac{1}{k\sqrt{3}} \operatorname{arctg} (C'_2 / C'_3)$. If therefor, during an interval $0 \leq t \leq t_{(0)}$, radiation $\underline{E} \times \underline{H}$ of performance ^{intensity} [accomplishment?] $L = \text{const}$ is introduced into the contrabatic transformer model, and the connected-up performance L_T actually is transformed, then b does not change its sign during this time interval. If after the conclusion of this interval this ^{input} ~~in-radiation~~ is turned off, then $b \rightarrow 0$. If immediately an ^{inflow} ~~in-radiation~~ of equal intensity again takes place, then the zero-point of a new t -scale is defined with this moment of switching-on [?], and an equally long interval of acceleration is added [involved?] without change of sign, which sign coincides with that of the first interval, etc. In this way a mean acceleration can be determined (with $t_{(0)}$ in a stationary case according to $\bar{b} = 1/t_{(0)} \int_0^{t_{(0)}} b(k, t) dt$, which no longer changes the sign (γ [is] sufficiently small and the process of in-oscillation [the getting-under-way of the oscillation] is to be ignored). If $kt_{(0)} = -\frac{1}{\sqrt{3}} \operatorname{arctg} (C'_2 / C'_3) =$

α and kt is taken as x , then [all the rest follows]

$$\alpha b = \int_0^\alpha b dx = \int_0^\alpha [C'_1 e^{-x} + e^{\frac{x}{2}} (C'_2 \cos x \sqrt{3} + C'_3 \sin x \sqrt{3})] dx$$

The expression is therefor divided into three elementary integrals, for which the values result as follows: $\int_0^\alpha e^{-x} dx = 1 - e^{-\alpha}$; $\int_0^\alpha e^{\frac{x}{2}} \cos x \sqrt{3} dx = \frac{2}{\sqrt{3}} e^{\frac{\alpha}{2}} \cos \alpha \sqrt{3} + 2 \sqrt{3} \sin \alpha \sqrt{3} - 1$; and $\int_0^\alpha e^{\frac{x}{2}} \sin x \sqrt{3} dx = 2 e^{\frac{\alpha}{2}} \sin \alpha \sqrt{3} - \frac{4}{\sqrt{3}} \sqrt{3} [(\cos \alpha \sqrt{3} + 2 \sqrt{3} \sin \alpha \sqrt{3}) e^{\frac{\alpha}{2}} - 1]$

Inserted, there follows for the mean acceleration [?] $\bar{b} = C'_1 (1 - e^{-\alpha}) + \frac{2}{\sqrt{3}} (C'_2 - 2 C'_3 \sqrt{3}) [e^{\frac{\alpha}{2}} (\cos \alpha \sqrt{3} + 2 \sqrt{3} \sin \alpha \sqrt{3}) - 1] + 2 C'_3 e^{\frac{\alpha}{2}} \sin \alpha \sqrt{3}$ with $\alpha = -\frac{1}{\sqrt{3}} \tan^{-1} \frac{C'_2}{C'_3}$, where the C'_i are to be determined from the C_i and γ . If therefore introduction [lit. in-coupling] of the radiation-amount used takes place in intervals $0 \leq t \leq t_{(0)}$

with $t_{(0)} = \gamma - \frac{1}{k\sqrt{3}} \operatorname{arctg} (C'_2 / C'_3)$, and in every interval the intensity of $\underline{E} \times \underline{H}$ remains constant, then there must be a mean [?] contrabatic

acceleration-effect $\bar{b}(\alpha) = \text{const}$ (time mean). If g is the acceleration of a freely falling body ~~falling gravimetrically~~ determined at the place of the working transformer model, then $\bar{b} = \bar{b}/g = 1$, or, as the case may be, $\bar{b} = \frac{b}{g} = 1$ applies for the comparison of the contrabatic disturbance with the surrounding gravitational field.

The value [quantity?] χ can be used for direct levitational investigations and χ for gravimetric investigations of time-span of b. The arrangement planned by me, in model-form[?], for the demonstration of the

contrabario effect is intended to transform a polarized 3cm wave from a magnetron of the highest possible radiation-performance^{intensity} (if possible, some hundreds of Watts in^{pulse}continuous line [stroke, streak?]). A magnetron tube of such productive power becomes necessary, because the whole arrangement, on account of the sparse means at our disposal, can be at present carried out only in a provisional way, and for this reason ξ becomes very small. An arrangement adapted to precision measurements is to be constructed only when a contrabario effect has been qualitatively demonstrated with the provisional apparatus. These measurements should take place in two series for various L values, after the completion of the provisional arrangement.

1) The arrangement is connected with the antenna-connection of the magnetron tube and mounted over the arrangement [must be a different sense of Anordnung here] of one of the usual gravimeters. With this apparatus g is determined to seven decimal places (international system of measurement) at the place of the measurement to be made. According to [possibly: after] this measurement the magnetron tube is inserted into [or: adjusted to] the net-pre-switching-contrivance [?] at continuous stroke, so that the disturbance χ must set in as an amplitude-modulated harmonic oscillation. This course of disturbance must, if it is still in the magnitude of $10^{-7} g$, be indicated by the gravimeter (possibly the light-indicator) and must be able to be recorded in the form of a measurement curve (perhaps an oscillograph). This measurement curve may be compared with the theoretically stationary χ curve, from which indications^{are given (result)} as to the temporal χ -process [actually: period of time?] during the period of in-oscillation and^{gives τ} as ~~to~~ the duration of the period of in-oscillation. 1/2 1/2

2) If $\lambda(t)$ is determined for $0 \leq t < \tau$, and τ [is determined] from series 1, then the elements of $\hat{a}$, as well as β_1 , and thus C_1 , can be ascertained. If the C_1 and, because of τ , also C_1' are fixed, which characterize the transformer model, then $\underline{t}_{(0)}$ can be calculated, and the net-pre-switch etc. of the magnetron can be set for ^{pulses}impulses of the duration $t_{(0)} \approx \underline{t}_{(0)} + \gamma \cdot \tilde{b}$ and thus $\tilde{\chi}$ can be theoretically be ascertained, because g is gravimetrically determined from the first. $\tilde{\chi} = -1$ means that the arrangement is not functioning at all. For $-1 < \tilde{\chi} < 0$ there are levitation

effects [indications?] of the transformer model [present, available], while for all $\chi > 0$, contrabary over-compensations of the g-field set in. $\tilde{\chi} = 0$ would characterize an abary [i.e. non-bary] state of the transformer model, but this state can only be approximated, because at even the slightest unavoidable disturbances of the g-field it must pass over into a

levitation ^{or} ~~over~~ a contrabarie over-compensation. The theoretical $\tilde{\chi}$ -value is empirically tested by mounting the model arrangement at the free end of a horizontal steel bar, the other end of which is anchored in a concrete socket. At the free end of this bar, next to the transformer model, there is a light indicator pointing in the direction of the bar, which fixes [focusses on?] on a zero-mark on a screen, as long as the arrangement is not mounted. After the mounting of the model, because of its weight, a sagging of the bar takes place, and hence a shifting of the light-indicator downwards, and this initial position is characterized by $\tilde{\chi} = -1$. Now the function of the magnetron tube is introduced [into the circuit], which brings into the model radiation impulses of the duration $t_{(0)}$, and now there must be a shifting of the light indicator from its initial position in the direction of the zero-mark. When such a shifting $\tilde{\chi} > -1$ has taken place, it can be compared with the theoretical $\tilde{\chi}$ -value. If the light indicator reaches the zero-mark, then this corresponds to the abaric state $\tilde{\chi} = 0$, and an exceeding of this mark [corresponds] to the contrabarie over-compensation $\tilde{\chi} > 0$.

When these ~~measurement~~ ^{of measurements} series have been carried out, a ~~not-improvised~~ ^{permanent} transformer model can be constructed on the basis of the results of the measurements, with the help of which [model] the technical condition [basis] for an analagous testing of the dynabarie effect has been created. As the completion of the two ~~measurement~~ ^{of measurements} series is still in preparation and at present no ~~measurement~~ ^d results are available, nothing can be reported as yet concerning the planned arrangement for the proof of the dynabarie effect.

The Principle of Dynamic Contrabarie and its Technological Perspectives for the Technology of Vehicles and Electricity [or Electronics?]

The technological possibilities that result from the realization of the contrabarie and dynabarie meso-field-state are based on the following conclusions [inferences], if we are to deal with those special perspectives which open up for the technology of vehicular travel and electricity. An electro-magnetic wave which transports a certain [amount] of energy is, in the contrabarie meso-field-state,

transformed into a mechanical field of acceleration. Similarly as in the Nichols effect, this field, if the contrabarc stimulator of state [?] is held fast in a suitable metal, can accelerate the metal electrons and function as a charge-separating force, i.e. as an electrical current generator. In this way electromagnetic radiation could be transformed directly into electrical [force] current. Held fast, such a contrabarc transformer could accelerate other [forms of] matter, especially liquids and gases (possibly current-generators, pumps etc.), while the transformer [is?] not anchored, must accelerate itself and bodies connected with it.

The dynabarc state on the other hand can be built up only endothermically. If one were to bring into its field a suitable metal-ion with a definite nuclear structure as well as with a suitable nuclear stage of stimulation[?], then the potential of the ^{atomic [atomar?]} gravitational field brought in by the ion would be radiated off in the form of electromagnetic waves. At the same time the inertia-mass of the ion would try to copy this field, and the gravitational flow of power connected with this must be at the expense of its energy-content. I do not consider it impossible that, with suitable nuclear structure, the energy level of its basic state is ^{stepped} ~~slowed~~ down [unterschriften is his own invention and would mean the opposite of exceed] to such a degree, that the nucleus is no longer defined in its original structure, and a markedly exothermic decomposition into partial structures of an even lower level sets in. The difference of level of the ^{ground} basic states would become free in the form of electromagnetic energy. If one therefore has put the metal in question (probably Pb) into a suitable ionizer [?], this would mean that the emerging cations (possibly after previous nuclear stimulation) are brought into the dynabarc field for the purpose of exothermic nuclear decomposition, which is electrotechnically controllable, for the radiation-achievement [?] of the nuclear energy becoming free in electromagnetic form depends on the number of ^{decomposing} nuclei per unit of time, i.e. on the density of the cations leaving the ionizer, which is readily controllable (the density, that is]. The electromagnetic energy becoming free during decomposition suffices, however, for the [needs of]

the contrabasic transformation condition, and could be transformed either directly into electrical [power] current or into mechanical motion. One would have to produce, e.g. with an induction ^[starter?] [?] generator

starting

(possibly contrabarically) an electrical direct [Anlasser?] current, that builds up the dynabaric field, produces the ions and heats up the tube systems of the electronic cybernetic. As soon as the decomposition of the first ions begins, a current of power arises in the electro-generator which turns off the Anlasser [starter, inductor?] and assumes the function of the Anlasser current. In this way a cycle ^[circuit] is closed that runs on dynamically as long as metal ions are available, if the thermodynamic losses of radiation are exactly compensated by the energy produced, but which runs itself dead [stops?], if the production of energy remains less than the loss of energy. The principle of such a circuit was designated by me as the principle of dynamic contrabaric. If the production of energy is somewhat overcompensated, then a second, not closed, circuit can be attached to this dynamo-contrabaric closed circuit [lit. circuit-close], whose production of energy can be controlled at will and can be given off to the outside. If ϵ is a loss factor ^{$\epsilon > 1$} dependent on the thermodynamic degree of effectiveness and on the energy balance [account] of the nuclear reaction used (the case of $\xi = 1$ can not, on the basis of the second principle of thermodynamics, not be attained as a matter of principle) and if μ_0 is the mass of the material brought to decomposition during the running [of the apparatus], there results for the energy given off outwardly, if $c = 3 \cdot 10^8 \left[\frac{m}{sec} \right]$ is the speed of light, $E = \mu_0 \frac{c^2}{\epsilon}$. In the case of the decomposition of uranium $\epsilon \approx 1200$, if the thermal losses are not taken into account. If one assumes, to figure most unfavorably [at worst], $\epsilon = 5000$, then a weight-kilogram, i.e. about 10^{-1} mass-kilogram (this is to be inserted for μ_0) yields an electrical energy of $E \approx 13 \cdot 10^{11}$ [watt.sec] $= 5 \cdot 10^5$ [KWh]. As probably very many kinds of atoms of common elements can, according to this principle be brought to decompose with good balance [account] of energy, and as ϵ , with some perfecting [of the apparatus, I presume] can certainly be held in the magnitude of some 10^2 , it becomes evident that an electro-generator working according to this principle of dynamic contrabaric must be extremely economic [ally rewarding].

Another technological perspective, which likewise results from the principle of dynamic contrabaric, opens up for vehicular development. For if the precisely controllable energy which is given off by the linked-up circuit is not transformed into electrical [power]current,

but rather the electromagnetic energy is conducted into contrabarie transformers which work upon the whole arrangement, then a gravitational leading [?] field, relative to its environment, must arise, in which the entire arrangement undergoes a relative acceleration. This pondero-motor^{ive} field of acceleration, which causes an accelerated motion of the whole arrangement on a geodetic world-line, is thus brought about dynamically by the arrangement, so that the principle of dynamic contrabarie, thus expanded, represents also a new ponderomotor^{ive} principle of ~~impetus~~^{impulse}. Thus e.g. the field of acceleration can, by means of suitable arrangement of the contrabarie transformers, oppose [counteract?] the earthly gravitational field. The strength of the field depends on the transformed radiation-accomplishment,^{intensity} and the latter, in turn, on the density of ions of the generator. Up to the point of compensation of the field of earthly gravitation the arrangement undergoes no effective [?] acceleration. This sets in, however, with over-compensation. As the contrabarie transformers can be arranged in all spatial directions [points of compass], as further the induced field of acceleration is not bound to any outer medium, and finally, the controlled effects and those used for control, being electro-magnetic processes, continue^{at} with the speed of light, it becomes evident that the principle of dynamic contrabarie permits the construction of a universal vehicle for astro-nautical, aeronautical and submarine purposes, whose ability to perform and to manoeuvre is not even approximated by any of the vehicles known at present. For purposes of comparison [visualization] this new principle of propulsion may be compared with the manner of working of present-day vehicles. The vehicle which at present attains the highest speeds of any is the rocket. The~~[rocket principle]~~ therefore comes closest by way of comparison.

Comparison of Dynamic Contrabarie with the Rocket Principle

For purposes of comparison the law of propulsion [momentum?] of a vehicle working on the principle of dynamic contrabarie (designated as D for brevity) must be examined. For this purpose the meso-field equations with separated state-operators, i.e. $H_1 = 0$ (here λ covers the

1 to 7) must be put into [into?] the form of an extreme [?] principle and written as a variation problem, so that a canonical formalism [?] becomes applicable. This formalism leads to the six-dimensional freedom of divergence $\sum_{k=1}^6 \frac{\partial}{\partial x_k} \sum_{\nu=1}^3 T_{(\nu)j}^k = 0$ with $1 \leq j \leq 6$, in which the lower-placed indices refer to co-variant components and the ~~high~~ ^{upper} ~~placed~~ ^(upper) ones, underlined to distinguish them from potentials, to contra-variant components. The mixed-variant $T_{(\nu)j}^k$ are functions of the field components and result, like the ~~general~~ ^{ordinary} [common?] tensor [?] of energy density, from the Lagrange-function of the canonical formalism, yet they act [are related to, stand in relation to?] only regular affinities with an orthogonal or unitary matrix of affinity (with non-vanishing [?] determinant) like mixed-variant tensor components. As in the following only such affinities occur, after integration the freedom of divergence becomes the tensor equation $\sum_{\nu=1}^3 [^2] \bar{T}_{(\nu)} = [^2] \bar{C} = \text{const}$ of a general principle of preservation, in which the letters ν refer to individual field effects ($[^m] \bar{A}$ means that A is a tensor of m degree). According to a pseudo-Euclidean approximation there arises [?] a Lorentz-invariant complex expression which, after a tensor transformation on the diagonal form, can be split into a real and an imaginary part (both parts are diagonal diagrams [Schemen: outline, line-representation]). In this way $\sum_{\nu=1}^3 [^2] \bar{T}_{\nu} = [^2] \bar{C}$ splits into two, now three-dimensional, equations, and the real part yields for each component ℓ (now ℓ is $\leq \ell \leq 3$) an impulse $\sum_{\nu=1}^3 P_{(\nu)\ell}$ [Satz can mean amount, principle or a number of other things] $= A_{\ell} = \text{constant}$ and analogously, the imaginary part yields an energy $\sum_{\nu=1}^3 Q_{(\nu)\ell}$ [Satz] $= B_{\ell} = \text{const}$. Both the impulse [Satz] and the energy [Satz] lead to the law of propulsion of a D, yet in the following the energy is to be employed.

The pseudo-Euclidean approximation is identical with the requirement of sufficiently low field densities, i.e. the contrabatically induced ponderomotive acceleration must be so constituted that the change of speed taking place per unit of time $|\Delta v| \ll c$, i.e. the acceleration, remains quasi-stationary [virtually st?]. This requirement is probably always fulfilled, for the acceleration depends on the transformed radiation ^{intensity} accomplishment, and the latter, in turn, on the quantity of matter decomposing per unit

of time. An increase therefore means, according to the second law of thermodynamics, a raising of the cooling effect, for which, however, a technical [technological?] limit is set. The maximum acceleration permitted by this cool-technological limit

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might be [conjecture] at 10^3 [m/sec^2], and this suffices, because 1 is $\ll 3 \cdot 10^5$, still very good in relation to [?] the quasi-stationary condition [requirement?], from which it follows that the rest-system of D belongs to the Lorentz group. This is also the case when, in the case of greatest technical perfection, we are concerned with an interstellar vehicle of great acceleration that meets the requirements of the form condition, for here too an acceleration of 10^3 [m/sec^2] would soon lead to relativistic speeds and the contraction of time involved therein. The observation of the form condition means that, if the machine always satisfies this condition, the motion - even at high acceleration - forms an analogy to free falling and takes place without pressure, which is to be attributed to the peculiarity of the contrabarc effect of emitting retrograde waves of gravitation. With the imaginary light-time $x_4 = ict$ the undimensioned measure of speed

$$\beta_l = i \cdot \frac{dx_l}{dx_4} = \frac{v_l}{c} \quad (\text{defined in the interval } 0 \leq \beta \leq 1)$$

can be introduced, if $v_l = \dot{x}_l$ is the speed component in the spatial direction l . With the abbreviation $\varphi_e = \beta_l \prod_{k=1}^3 (1 - \beta_k^2)^{-\frac{1}{2}}$

the $Q(\)$ from $B_l = \text{const.}$ as functions of β_l , and with the momentary[?] rest energy $E_0(\beta_1, \beta_2, \beta_3)$ of D in the form $Q_{(1)l} = \int \rho_l(\varphi_e \frac{dE_0}{d\beta_l} + E_0 \cdot \frac{d\varphi_e}{d\beta_l}) d\beta_l$, as well as $Q_{(2)l} = E_0 \frac{d\varphi_e}{d\beta_l}$ and $Q_{(3)l}$ can be made equal [I guess at this, because there is no participle here to complete the sense of "be made," and further am forced to guess at where the "be made equal" belongs] to

$\varphi_e \frac{dE_0}{d\beta_l} + \int E_0 \frac{\varphi_e}{4} (6 + \beta_l^2) d\beta_l$. The expressions for $\nu=1$, and $\nu=2$ may be directly interpreted as momentary kinetic and potential energy (the potential energy refers to the still available reserves in the propelling load [charge?]) of D, while in $\nu=3$ the first ^{term} ~~summand~~ describes the energy emitted in the form of gravitational waves, and the second probably [describes] an energy reaction of this gravitational wave emission upon the contrabarc transformer. Introduction [insertion?] into

$\sum_{\nu=1}^3 Q_{(\nu)l} = B_l = \text{const.}$ and total differentiation according ^[of B_l] to β_l yields $\varphi_e \cdot \frac{d^2 E_0}{d\beta_l^2} + (2 \frac{d\varphi_e}{d\beta_l} + \beta_l \varphi_e) \cdot (\frac{dE_0}{d\beta_l} + \beta_l \frac{d\varphi_e}{d\beta_l} + \frac{\varphi_e}{4} (6 + \beta_l^2)) \cdot E_0 = 0$ or, if $m(\beta_1, \beta_2, \beta_3)$ is the momentary rest-mass, after substitution with the energy-material equivalent $E_0 = m c^2$ finally

$$\frac{d^2 m}{d\beta_l^2} + \chi_l \frac{dm}{d\beta_l} + \Lambda_l m = 0, 0?$$

with the abbreviations

$$\text{and } \Lambda_l = \frac{1}{\varphi_e} \frac{d^2 \varphi_e}{d\beta_l^2} + \beta_l \frac{d}{d\beta_l} \ln \varphi_e + \frac{1}{4} \beta_l^2 + \frac{3}{2}$$

$$\chi_l = 2 \frac{d}{d\beta_l} \ln \varphi_e + \beta_l$$

If $\frac{d^2}{d\beta_l^2} + \chi_l \frac{d}{d\beta_l} + \Lambda_l = D_l$ is conceived of as a differential operator, and if these three operators are combined in the diagonal plan $\hat{M} = (\delta_{kl} D_l)_3$, then the general law [principle?] of propulsion of a vehicle working on the principle of dynamic contrabarie, with the assumption [assuming] quasi-stationary acceleration, reads: $\hat{M}; m \geq \hat{O}$.

For fuel-technological investigations it must be taken into account that $\hat{M}; m \geq \hat{O}$ encompasses only the loss in mass which is equivalent to the energy $E_{(G)} = \mu c^2$ emitted in the form of gravitational waves. If W is the energy actually produced and $\dot{Q}_T > 0$ the thermal loss accomplishment [?], then with the thermal degree of effectiveness $\eta_T = 1 - \frac{\dot{Q}_T}{\dot{W}} < 1$ $E_{(G)}$ is always equal to $\eta_T W$. Here, if $a \geq 1$ is a balance factor of the exothermic nuclear reaction used (relation of the rest energy of the nucleus before the reaction to the energy becoming free exothermically), $W = E_{(t)}/a$ becomes expressible [can be expressed] by the rest energy $E_{(t)}$ of the fuel load. The actually estimated energy $E_T = \sigma E_{(t)}$ is taken [assumed] to be higher by a safety factor $\sigma \geq 1$ than $E_{(t)}$. Accordingly, $E_{(G)} = \frac{\eta_T}{\sigma a} E_T$ or, with $E_{(T)} = \mu_0 c^2$ and $\epsilon = \frac{\sigma a}{\eta_T}$ (loss factor) yields [furnishes] $\mu_0 = \epsilon \mu$ the connection between μ out of $\hat{M}; m \geq \hat{O}$ and the technical fuel load μ_0 . Summed up, the following is true of the law of propulsion: $|\Delta v| \ll c$, $\hat{M}; m = \hat{O}$, $\mu_0 = \epsilon \mu$, $\hat{M} = (\delta_{kl} D_l)_3$, $\epsilon = \frac{\sigma a}{\eta_T} > 1$

$$D_l = \frac{d^2}{d\beta_l^2} + \chi_l \frac{d}{d\beta_l} + \Lambda_l, \quad \chi_l = 2 \frac{d}{d\beta_l} \ln \varphi_e + \beta_l$$

$$\Lambda_l = \frac{1}{\varphi_e} \frac{d^2 \varphi_e}{d\beta_l^2} + \beta_l \frac{d}{d\beta_l} \ln \varphi_e + \frac{1}{4} \beta_l^2 + \frac{3}{2}, \quad \varphi_e = \beta_l \prod_{k=1}^3 (1 - \beta_k^2)^{-\frac{1}{2}}$$

$$\beta_l = \frac{v_l}{c}$$

This law can be solved [?] on an elementary level [basically?] if the world line of the total motion of D runs constant except for the finite number of $1 \leq \lambda \leq N < \infty$ non-constant occurrences [circumstances?] (the start is to be stated as $\lambda - 1 = 0$), if each value x dependent on the form of the world line remains constant between two neighboring non-constant occurrences $x_{\lambda-1} \rightarrow x \rightarrow x_\lambda$, and if along [side?] such a constant branch ϵ_λ is $= \text{const.}$ (g_λ relates g locally to the world point λ , but g_λ to the constant branch between $\lambda - 1$ and λ). The marginal values for $m(\beta_1, \beta_2, \beta_3)$ are $m(0) = \text{const.}$ (initial [beginning?] value) and $\lim m = 0$, because of the principle of relativity $0 \leq \beta < 1$.

If $H(\beta, \beta_2, \beta_3)$ is an actual auxiliary function, then, with the [preliminary] statement $m \sim e^H$ because of $\hat{H}$; $m \sim \hat{H}$; e^H and $D e^H (\frac{d^2 H}{d\beta_2^2} + (\frac{dH}{d\beta_1})^2 + \chi_1 \frac{dH}{d\beta_1} + \Lambda_2)$

if $\frac{dH}{d\beta_1} = \frac{d}{d\beta_1} \ln \eta_1 - \frac{1}{2} \chi_1$ is introduced as a transformation,

$m; m = \hat{O}$ becomes $(\frac{\partial K}{\partial \eta_1} \frac{d^2 \eta_1}{d\beta_1^2}) = -E$, because $\frac{1}{2} \frac{d\chi_1}{d\beta_1} + \frac{1}{4} \chi_1^2 - \Lambda_1$ is $= -1$. Taking into account the laws of matrix calculation and the marginal values, there

follows for H , after integration along a constant branch and the formation of matrix traces [?], the solution

$-H \uparrow = \left[\ln \frac{3}{\lambda-1} (1-\beta_2^2)^{-\frac{1}{2}} \sqrt{\beta_2 e^{\frac{\beta_2^2}{4\beta_1^2}}} \operatorname{arcc} \beta_2 \right]_{\lambda-1}^{\lambda} \frac{m_{\lambda}-1}{m_{\lambda}}$
If $\lambda-1$ is the m -value in λ and if the mass ratio $A = \frac{m_{\lambda}-1}{m_{\lambda}}$ is intro-

duced, it follows, if it is taken into account that a retardation from [of?] $\lambda-1$ to λ is equivalent to an acceleration of λ to a world point $\lambda-1$ located

earlier, $-H \uparrow = \ln A^{\pm 1}$, in which the upper pre-sign [?] refers to accelerations the lower one, however, to retardations from a world point located earlier to one located later; this [is] relative to the coordinates of

the starting-points in each case (in such a system the occurrence of the start is the zero point of the coordinates). A comparison with the solution and potentialization yields

$$A_{\lambda} = \frac{3}{\lambda-1} \left(\frac{1-\beta_{2\lambda}^2}{1-\beta_{2\lambda-1}^2} \right)^{-\frac{1}{2}} \sqrt{\left(\frac{\beta_{2\lambda} e^{\frac{\beta_{2\lambda}^2}{4\beta_{1\lambda}^2}} \operatorname{arcc} \beta_{2\lambda}}{\beta_{2\lambda-1} e^{\frac{\beta_{2\lambda-1}^2}{4\beta_{1\lambda-1}^2}} \operatorname{arcc} \beta_{2\lambda-1}} \right)^{\pm 1}}$$

If μ_{λ} is the inertia mass of the energy consumed from $\lambda-1$ to λ , then

$$m_{\lambda-1} = \mu_{\lambda} + m_{\lambda} \quad \text{with } m_{\lambda} = m_e + \sum_{k=\lambda+1}^N \mu_k \quad \text{applies, if } m_e \geq m_0 \text{ is}$$

the end mass and m_0 is the rest mass of the unloaded machine (m_e refers

likewise to the particular [peculiar to] system of D). $m_e = m_0$ becomes

possible if the reaction products are immediately emitted, which is not possible, to be sure, out of open tubes, because the machine is expected

to work in any hydrosphere [I judge he means water] or atmosphere (in

this way the rocket-technological project of the outer station would

become unnecessary) and a high [almost complete?] vacuum must prevail in

the generator. According to my experience an emission of cations (the

reaction products appear as cations) out of tubes closed vacuum-tight

with certain crystals into any medium becomes possible, so that $m_e = m_0$

may well become technologically realizable. μ_{λ} is equal to $(A_{\lambda}-1)m_{\lambda}$, ~~or~~

$$= (A_{\lambda}-1)(m_0 + \sum_{k=\lambda+1}^N \mu_k) \quad \text{or with } \mu_{\lambda} = \mu_0 \Delta / \epsilon_{\lambda} \quad \text{, after the summation of all the constant world$$

line branches with the application of an arithmetical process of recur-

$$\text{sion [?], } \sum_{\lambda=1}^N \frac{\mu_0 \Delta}{\epsilon_{\lambda}} = \sum_{\lambda=1}^N (A_{\lambda}-1) m_0 + \sum_{k=\lambda+1}^N \mu_k = m_0 \left(\sum_{\lambda=1}^N A_{\lambda} - 1 \right)$$

Summed up [summarized?], the fuel-technological solution of the law of propulsion reads $\sum_{\lambda=1}^N \frac{\mu_{0\lambda} \Delta}{\epsilon_{\lambda}} = m_0 \left(\frac{\pi}{\lambda} A_{\lambda} - 1 \right)$ or, if $\epsilon_{\lambda} = \epsilon$, i.e. the same fuel is always used, $\mu_0 = \epsilon m_0 \left(\frac{\pi}{\lambda} A_{\lambda} - 1 \right)$ with $\mu_0 = \sum_{\lambda=1}^N \mu_{0\lambda}$

In this solution A is $A = \frac{\pi}{\lambda} \left(\frac{1 - \beta_{\lambda}^2}{1 - \beta_{\lambda}^2} \right)^{\frac{1}{2}}$ in which $I_{\lambda} = \frac{\pi}{\lambda} \frac{3}{\sqrt{\beta_{\lambda} e^{\frac{1}{2}\beta_{\lambda}^2} \operatorname{arcc} \beta_{\lambda}}}$ also designated as the interstellar factor, for only for very high speeds, such as may occur in possible interstellar journeys, does I_{λ} deviate from the value 1 enough to mention.

This solution can be compared with the rocket principle. A rocket R and a D (both consist of only one stage [level?]) start from the x_2, x_3 -plane of a Cartesian system of coordinates ($\beta_{\ell 0} = 0$ for all spatial directions ℓ) and accelerate in a straight line along parallels to the x_1 -axis in to attain

$\beta_{1,1} = \beta$, while $\beta_{2,1} = \beta_{3,1} = \text{remain} = 0$. If $\kappa = \mu_0/m_0$, then the following applies $\kappa_D = \frac{\mu_{0D}}{m_{0D}} = \epsilon \left(\frac{3}{\sqrt{1 - \beta^2}} \frac{\beta e^{\frac{1}{2}\beta^2} \operatorname{arcc} \beta}{1} - 1 \right)$, because for $\beta_0 = 0$ the relations

$e^{\frac{1}{2}\beta_0^2} = 1 - \beta_0^2 = 1$ and $\lim_{\beta_0 \rightarrow 0} \beta_0 \operatorname{arcc} \beta_0 = \lim_{\beta_0 \rightarrow 0} \cos \beta_0 = 1$ apply [are true?]. Correspondingly, there results [follows] for the rocket,

if in $\beta_a = v_a/c$ speed of emission [exhaust?] from the valve is designated as v_a , $\kappa = e^{\beta_a^2} - 1$. As a rocket is never capable of attaining relativistic speeds, there remains always $\beta \ll 1$, which after a series development

permits the approximation $\sqrt{\beta e^{\frac{1}{2}\beta^2} \operatorname{arcc} \beta} \approx 1$ and $(1 - \beta^2)^{-\frac{1}{2}} \approx 1 + \beta^2/2$. This yields $\kappa \approx \epsilon \frac{\beta^2}{2}$ (it is worthy of notice that $\mu_{0D}/\epsilon \cdot c^2 \approx \frac{1}{2} m v_a^2$ yields the kinetic energy of classical mechanics for $\beta \ll 1$). If $\mu_0 D = \mu_{0R}$ and equal acceleration $b_D = b_R = b$ of both machines is called for, then $V = \frac{\kappa_R}{\kappa_D} = \frac{m_{0D}}{m_{0R}} = \frac{K_D}{K_R}$

can be interpreted as the ratio of force of propulsion

[lit. pushing]. For this ratio there results, because of the non-relativistic approximation, $V \approx \frac{2}{\epsilon \beta_a^2} (e^{\frac{\beta_a^2}{2}} - 1)$ for $\beta \ll 1$. V thus depends only on β and the two parameters ϵ and β_a , which describe the ways of working of both machines.

If one assumes in the numerical example that D works very unfavorably with

$\epsilon = 5000$ and that R, optimally extrapolated as a nuclear rocket (hypothetically assumed) permits $v_a = 6 \times 10^4 \text{ m/sec}$ then $\beta_a = \frac{1}{5000}$, and if both machines should attain $v = 3 \times 10^5 \text{ m/sec}$, i.e. $\beta = \frac{1}{1000}$, then

V becomes $\approx 57,200$, i.e. the extremely poorly working D would still be

able to attain approximately 57.200 times the propulsive power of an

optimally performing super-rocket.

From this rough calculation it is evident that the principle of dynamic contrabarie could permit in every way an absolutely ideal solution of the astronautical problem, all the more as the manner of functioning of D is not tied to any environmental [stratosphere etc?] medium and cannot be influenced by such media as a matter of principle, so that such a space vehicle would have to be universally practicable even within any atmosphere or hydrosphere. For this reason it seems suitable enlarge upon some considerations looking toward the solution of the astronautical problem with the help of D.

Dynamo-contrabarie Astronautics

The simplified solution $\mu_0 = \epsilon m_0 \left(\prod_{\lambda=1}^N A_{\lambda} - 1 \right)$ is to be used for the development of simple first [handy?] formulas.

At the start we exclude accelerated accelerations, i.e. on the constant world line branches the accelerations are to be g_{λ} const, i.e. the motions [are to be taken as] spatial-temporal hyperbola motions. Let the maximum acceleration that occurs be $b \approx 10$ [m/sec²], so that D does not need to suffice [meet the requirements of?] for the form condition. If β remains so low that potentials higher than second ones may be ignored, then a series development shows $1 \approx \frac{3}{2} \frac{4 + \beta^2}{6 - \beta^2}$. If the maximum acceleration is not exceeded, then within the planetary system all speeds remain within the range $0 \leq \beta \leq \beta_{\max} = \frac{1}{30}$, and for this, with very good approximation, one can always put $I > 1$. In this way the designation interstellar factor is justified, for this factor deviates enough to matter from 1 only at great speeds, such as never occur in planetary journeys. Even though the β = values are so slight in these journeys that I_{Δ} does not appear, nevertheless the speeds will be incomparably greater than those with which one deals in rocket technology. To be sure the probability of in-shooting [collision?] of cosmic matter extraordinarily small with the relatively low rocket speeds, but this probability would become practically a certainty at a speed of several 10^3 [km/sec]. On the other hand most cosmic dust matter moves on [in?] stable orbits within the plane of the course of the planets, so that on this plane the greatest cosmic density of matter will be found, while outside the orbit plane this density diminishes markedly with increasing distance. Therefore, in order to be able to exploit the

power of a D completely, one would have to place the orbit plane of a space ship orthogonally to the orbit plane of the planet, so that the normal distance of D from it [the plane, I guess] increases with rising speed, and attains its greatest value in the speed-maximum of the center of the orbit. With the beginning of retardation the machine must again move to the plane of the planet orbit, to reach, finally, with the speed zero, the orbit plane of the target-planet. This manoeuvre designated by me as the interstellar leap [also: gambol, caper] is ofcourse not achievable by rockets, and assumes an entirely new technique of navigation. The advantage of the process lies in the fact that, with increasing ship-speed, regions are traversed in which the density of matter diminishes in the same proportion. The interstellar jump-height (utmost ^[or peak] height over the plane of the planet orbit) is to be determined in this [matter, affair etc.] from the peak speed, the distribution of matter and the required safety of travel.

If a passage from the starting planet S to the target planet Z is to be carried out dynamo-contrabarily, and if s is the distance in a straight line from the starting-point S to the target point Z (place of the target planet in time-point of arrival), there results, with rectilinearly uniform acceleration b up to $\frac{s}{2}$ and succeeding retardation [deceleration?] that is equal and opposite, as time of passage $T_F = 2\sqrt{\frac{s}{b}}$, as we need not calculate now relativistically. For the carrying out of the interstellar leap - let its peak height over $\frac{s}{2}$ be h - one would start from S with an acceleration ^b of the longitudinal axis in the direction s. At the same time an acceleration of the high [?] axis, still to be calculated would lift the machine out of the plane of the planet orbit in the direction h. After the time $\tau = \frac{T_F}{4}$ this high axis ^{al} acceleration would be switched over into an equal and opposite retardation. According to [after?] $2T_F$ the midpoint of the orbit is reached in h and the peak speed in the direction s. Now the acceleration of the longitudinal axis is switched over into the retardation, while the retardation of the high axis remains and moves the machine in the opposite direction from h toward the plane of the planet orbit. In $3T_F$ this high axis ^{al} movement could be retarded by an acceleration directed away from the plane of the planet orbit. Finally, in $4T_F = T_F$ the longitudinal ^{axis} as well as the high axis acceleration would be switched off..

During the entire passage, finally, another acceleration would have to operate, a transverse axis acceleration to be determined from the constellation of the planets, which compensates the relative speed between the two planets and is likewise switched off after $4\tau_F$, so that at this point of time the ship, in relation to the target planets (which is now in the vicinity of the location of the ship), now has practically the speed zero, so that the landing may be begun. The individual switch-over points of the acceleration are, however, nothing other than the inconstant world-points, which interrupt the otherwise constant course of the total world-line (their spatial projection is the temporal-spatial course [?] of the ship's motion]. For the fuel-technological treatment of such a dynamo-contrabario interstellar leap one should place a positively-oriented Cartesian x,y,z-system with the zero point [something seems to be lacking here, logically] in the starting point S, in such a way that the x-axis coincides with $\overline{SZ}$, the plane of the planetary orbit lies in the x,y-plane and that the planetary rotation, seen from the positive x-axis, takes place counterclockwise.

If the index H designates the outward trip and the index R the return trip, then the speed components in the inconstant switch-over-events [?] of the acceleration (only these components are necessary in the solution of the law of propulsion) for simple planetary trips (consisting of outward journey, stopover and return trip) [the speed components mentioned 4 lines above] are summed up in the following two matrices:

$$\hat{\beta}_H = \begin{vmatrix} \beta_{x,0} & \beta_{y,0} & \beta_{z,0} \\ \beta_{x,1} & \beta_{y,1} & \beta_{z,1} \\ \beta_{x,2} & \beta_{y,2} & \beta_{z,2} \\ \beta_{x,3} & \beta_{y,3} & \beta_{z,3} \\ \beta_{x,4} & \beta_{y,4} & \beta_{z,4} \end{vmatrix} \quad \begin{array}{l} 0\tau_H \equiv \lambda(x,y,z) = 0 \\ 1\tau_H \equiv \lambda(z) = 1 \\ 2\tau_H \equiv \lambda(x) = 2 \\ 3\tau_H \equiv \lambda(z) = 3 \\ 4\tau_H \equiv T_H \equiv \lambda(x,y,z) = 4 \end{array}$$

For the return trip S and Z exchange their significance [meaning] and the beginning of the coordinates also is shifted from S to Z. The following applies under these assumptions:

$$\beta_R = \begin{vmatrix} \beta_{x,5} & \beta_{y,5} & \beta_{z,5} \\ \beta_{x,6} & \beta_{y,6} & \beta_{z,6} \\ \beta_{x,7} & \beta_{y,7} & \beta_{z,7} \\ \beta_{x,8} & \beta_{y,8} & \beta_{z,8} \\ \beta_{x,9} & \beta_{y,9} & \beta_{z,9} \end{vmatrix} \quad \begin{array}{l} 0\tau_R \equiv \lambda(x,y,z) = 5 \\ 1\tau_R \equiv \lambda(z) = 6 \\ 2\tau_R \equiv \lambda(x) = 7 \\ 3\tau_R \equiv \lambda(z) = 8 \\ 4\tau_R \equiv T_R \equiv \lambda(x,y,z) = 9 \end{array}$$

In simple planetary trips there are, therefore, $N \leq 9$ constant world line branches. Under the assumption $\epsilon_\lambda = \epsilon$ const, $\mu_0 = \epsilon m_0 \left(\frac{g}{\lambda=1} A_\lambda - 1 \right)$ therefore applies. If the duration of the expedition is assumed as sufficiently brief in duration, so that S and Z do not displace [?] each other materially (the pre-condition for this could surely be determined with ease from the mean sun intervals, times of revolution, and from the constellations of S and Z), then the return trip can take place on approximately the same course as the outward trip, i.e. it would be $(T_H \approx T_R) = T_F$ and, because of the congruence of orbits $\hat{\beta}_H = \hat{\beta}_R = \hat{\beta}$, which brings about $A_1 = A_6, A_2 = A_7, A_3 = A_8, A_4 = A_9$ and A_5 , therefore $\frac{g}{\lambda=1} A_\lambda = A_{\lambda=1} \frac{g}{\lambda} A_\lambda^2$. The presupposition for this, to be sure, is that the duration of the expedition $T_E = T_H + T_R + T + T_0$ ~~T_0~~ is so measured that one may actually set down $\hat{\beta}_H = \hat{\beta}_R$. $T_0 + T$ is the stopover time on the target planet, T_0 being the rest time during which the machine is not working and T the driving [working?] time during which the falling-acceleration g_0 is compensated out to Z and the D is used as a universal vehicle. During this time T [the] fuel load is consumed the amount of which is expressed in A_5 . With the pre-supposition $\hat{\beta}_H = \hat{\beta}_R$, therefore, only $\hat{\beta}_H = \hat{\beta}$ needs to be taken into account. The y-components of the acceleration are obviously very slight, as they refer [relate?] only to the relative speed between S and Z. The maximum would appear during a passage from the planet Mercury to the planet Venus during a conjunction [?] (a conjunction trip in contrast to an opposition trip) and amounts to $\beta_{y,max} \approx \frac{1}{3000}$. As in the approximation for μ_0 , with $I_\lambda \approx 1$, the β -values occur only in the form $1 - \beta^2$, and all β_y remain $\leq \beta_{y,max}$, the β_y in $\hat{\beta}$ may be disregarded (but this is not permissible for fuel technological investigations). Besides, there are in $\hat{\beta}$ the $\beta_{x,0} = \beta_{2,0} = \beta_{x,4} = \beta_{2,4} = 0$, and if the orbit is assumed as symmetrical to the normal height h on all world line branches, because of $|b| = \text{const}$, $\beta_{x,2} = \beta_s$ (speed maximum in the direction s) and $\beta_{2,1} = \beta_{2,3} = \beta_n$ (speed maximum normal to the plane of the planetary orbit). Also, at the peak height h of the interstellar leap $\beta_{2,2}$ must be equal to 0.

Thus,

$$\hat{\beta} = \begin{vmatrix} 0 & 0 & 0 \\ \beta_x & 0 & \beta_h \\ \beta_s & 0 & 0 \\ \beta_x & 0 & \beta_h \\ 0 & 0 & 0 \end{vmatrix}$$

becomes, i.e

$$A_1 = A_2 = A = (1 - \beta_x^2)^{-\frac{1}{2}} (1 - \beta_h^2)^{-\frac{1}{2}}$$

$$\text{and } A_2 = A_3 = B = \sqrt{\frac{1 - \beta_x^2}{1 - \beta_s^2}}$$

$$\text{and hence } \frac{4}{\pi} A^2 = (AB)^4 = (1 - \beta_s^2)^{-2} \cdot \frac{1}{(1 - \beta_h^2)^{-2}}$$

Because of the approximation $0 \leq \beta \leq \beta_{max} \ll 1$ higher potentials than

second potentials of the β -values may be disregarded, so that $(1 - \beta_h^2)^{-2} (1 - \beta_s^2)^{-2} \approx$

$$1 - 2(\beta_h^2 + \beta_s^2) = 1 - 2\beta^2 \quad \text{with } \beta^2 \text{ may be taken as equal to } \beta_s^2 + \beta_h^2$$

. Summed up, therefore, $\mu_0 \approx \epsilon m_0 \frac{A_3 + 2\beta^2 - 1}{1 - 2\beta^2}$ becomes $\epsilon m_0 (A_s + 2\beta^2 - 1)$

, because also for $\beta_{max} = \frac{1}{30}$ for the denominator

$$1 - 2\beta_{max}^2 = 1 - \frac{1}{450} \approx 1 \quad \text{can be put [set down] with good approximation.}$$

All that remains to be done is to ascertain A_s . During the time t let g_0 be

compensated for [to?] Z. One puts down with the energy equivalent $mc^2 =$

$$\frac{1}{2} m g_0^2 t^2 \text{ with } 0 \leq t \leq T, \text{ and } m = m(t)$$

$$\alpha = \frac{1}{2} g_0^2 / c^2 = \text{const yields the expression } \frac{1}{m} \frac{dm}{dt} = \frac{2\alpha t}{1 + \alpha t^2} =$$

$$\frac{d}{dt} \ln(1 + \alpha t^2). \text{ This differential equation is integrated between the}$$

events [?] $\lambda = 4$ and $\lambda = 5$, in which $\lambda = 4$ designates the landing on Z,

and $\lambda = 5$ the start of the return trip. This integration is extended [?]

to the right over the time of propulsion T upon [towards?] Z. After carry-

$$\text{out the integration one has } \ln m_4 / m_5 = \int_0^T \frac{d}{dt} \ln(1 + \alpha t^2) dt = \ln(1 + \alpha T^2)$$

and, because of $m_4 / m_5 = A_s$, after potentializing, $A_s = 1 + \alpha T^2$, by which

there is yielded for the fuel load in the case of a simple planet trip the

$$\text{estimate } \mu_0 \approx \epsilon m_0 (2\beta^2 + \alpha T^2), \quad \alpha = \frac{1}{2} \frac{g_0^2}{c^2} \text{ and } \beta^2 = \beta_h^2 + \beta_s^2 \text{ and}$$

, presupposing that $(T_E = T_H + T_R + T + T_0)$ is measured at

[estimated?] for so brief a span of time, that $(T_H \approx T_R) = T_F$ and

$$\hat{\beta}_H = \hat{\beta}_R \quad \text{may be assumed.}$$

From μ_0 the maximum cooling accomplishment can, finally, be ascertained

which must be used in the journey in question. On the basis of the deriva-

tion of the loss factor ϵ , the energy-actually-produced W stands in the

[following] relation [ratio] to the rest energy of the total fuel load:

$$\epsilon_{(T)} = \sigma a W, \text{ or } W = \frac{\mu_0 c^2}{\epsilon \eta_T}. \text{ Taking into account } \epsilon = \text{const, there follows from}$$

μ_0 for the actually produced maximum accomplishment after [according to?]

$$\text{time differentiation } \dot{W}_{max} = \frac{\mu_0 c^2}{\epsilon \eta_T} = \frac{A m_0 c^2}{\eta_T} (\beta_h \dot{\beta}_h + \beta_s \dot{\beta}_s).$$

$$\cdot \frac{1 + \alpha T^2}{(1 - 2\beta^2)^2} \approx \frac{A m_0 c^2}{\eta_T} (\beta_h \dot{\beta}_h + \beta_s \dot{\beta}_s)$$

, for because of $\hat{\beta}_H = \hat{\beta}_R$, $\alpha T \ll 1$ must be sufficiently small, so that $\alpha T^2 \ll 1$ may likewise be disregarded. As it was not the fuel load [that happened to be] present at the particular time, but rather

in this trip

the portion on hand, at the beginning of the motion, i.e. the maximum fuel amount, that was used for the differentiation, $\dot{W}$ must result [take place?] at the beginning of the trip. This initial value is, however, at the same time the maximum, for while constant accelerations have been presupposed, the maximum of the accomplishment $\dot{W}$ to be expended will lie there where the momentary mass has its maximum, i.e. at the beginning of the trip. For $\dot{W} = \dot{W}_{\max}$ the ^{thermal energy loss} damage [?] accomplishment $\dot{Q} \approx \dot{Q}_{\max}$, which comes through the generator wall, must also have its peak value. With the abbreviation $\gamma = \beta_h \dot{\beta}_h + \beta_s \dot{\beta}_s$ one therefore has, if $\eta_K = 1 - \frac{\dot{Q}_{\max}}{\dot{W}_{\max}}$ is the degree of effectiveness of the necessary maximum generator cooling, for the maximum of the ^{energy loss} thermal damage accomplishment $\dot{Q}_{\max} = (1 - \eta_K) \dot{W}_{\max}$, i.e. $\dot{Q}_{\max} \approx 4m_0 \frac{c^2}{\eta_T} (1 - \eta_K) \gamma$, and this accomplishment must be carried off by a cooling arrangement. All other cooling accomplishments occurring during the expedition must remain smaller than this maximum, if the conditions with respect to acceleration that have been assumed are fulfilled. One may still attempt to express μ_0 and $\dot{Q}_{\max}$ by means of the determination pieces [parts, fragments, portions?] of the course chosen, i.e. by the straight-line interval [distance?] s between S and Z, the interstellar height of the leap h , and the acceleration b in the s -direction. The calculation can be carried out ^{by classical kinetics} classically-cinematically in the realm of validity of the Galilei group, because β always remains $\ll 1$. With the use of the x, y, z system (see above) $\ddot{x} = b = \text{const}$ and $\ddot{z} = \frac{h}{\tau_E} = 4b \frac{h}{s}$, because $\tau_F = \frac{1}{4} T_F = \frac{1}{2} \sqrt{\frac{s}{b}}$. Further, it follows that $\dot{x}_{\max} = \sqrt{sb}$ and $\dot{z}_{\max} = \dot{z} \tau_F$. Related [applied?] to c , the following therefore result: $\beta^2 = \beta_s^2 + \beta_h^2 = \frac{1}{c^2} \frac{b}{s} (s^2 + 4h^2)$ and $\gamma = \beta_s \dot{\beta}_s + \beta_h \dot{\beta}_h = \frac{1}{c^2} \left(\frac{b}{s} \right)^{\frac{3}{2}} (s^2 + 8h^2)$. If the formula [pattern?] $\hat{B}$ sums up the necessary determination pieces, there result in that way the first [?] formulae [rough, approximate?] $\beta_H = \beta_R, T_F = 2\sqrt{\frac{s}{b}}, T_E = 2T_F + T + T_0$, $\mu_0 \approx 4m_0/2sc^2 [4b(s^2 + 4h^2) + sg_0^2 T^2]$ $\hat{B} = \begin{vmatrix} s & h & b & 0 \\ T & T_0 & g_0 & 0 \\ \epsilon & m_0 & \eta_T & \eta_K \end{vmatrix}$ $\dot{Q}_{\max} \approx 4m_0/\eta_T (1 - \eta_K) \left(\frac{b}{s} \right)^{\frac{3}{2}} (s^2 + 8h^2)$ with which fuel-technological and cooling-technological estimates can be carried out.

As a rough calculation the numerical example of a Mars expedition in the form of a simple planetary journey is to be examined according to this formula. Let us assume the least favorable constellation, namely the

Earth - Mars conjunction, with $s \approx 3.8 \times 10^8$ [km]. The height of the interstellar jump is assumed to be $h \approx 2 \times 10^8$ [km] (the courses in these conjunction [?] flights must never be laid out too daringly [allowing too little margin of safety, I guess], because the sun is situated in the orbit planes of these conjunction journeys).

Let acceleration take place at $10 \text{ [m/sec}^2\text{]}$ in the direction of the longitudinal axis. Let the stopover on the target planet Mars amount to 114 hours, of which the rest-time $T_0 = 14$ hours is to be used for possible overhauling of the vehicle. Let the machine function favorably with $\epsilon \approx 30$ and have an empty mass of 50 tons [?] (weight in relation to the earth's surface). Besides, let $\eta_K = 0.9999$ be assumed, which can be attained with certainty, because in the generator the energy is in practice freed only in the form of electromagnetic waves that are reflected from the walls, so that the reciprocal action between radiation and the reflecting generator wall can be reduced to a minimum possibly by crystal layers that cause interference. For η_K one may set [substitute?] $\eta_K \approx 1$, as the ^{thermal} λ [ir] radiation $\dot{Q}_T$ constantly taking place through the ship's wall is always $\ll \dot{W}$, and

$\eta_T \approx 1$ does not appear in the form $1 - \eta_T$. The insertion of the determin-

ants
ation pieces

$$\begin{vmatrix} S & h & b & 0 \\ T & T_0 & g_0 & 0 \\ \epsilon & m_0 & \eta_T & \eta_K \end{vmatrix} = \begin{vmatrix} 3.8 \times 10^{11} & 2 \times 10^{11} & 10 & 0 \\ 3.6 \times 10^5 & 50.4 \times 10^3 & 3.3 & 0 \\ 30 & 5 \times 10^4 & 1 & 0.9999 \end{vmatrix}$$

into the first [?] formulae yields, in the first place, for the time of the outward trip $T_F \approx 4 \times 10^5 \text{ sec} \approx 111 \text{ h}$ and $T + T = 114 \text{ [h]}$.

Obviously the requirement of congruence $\hat{\beta}_H = \hat{\beta}_R$ is thus met, so that the first formulae are applicable. Thus $T_F \approx 336 \text{ h}$ becomes $= 14 \text{ [D]}$, as well as $\mu_0 \approx 285 \text{ [kg]}$ (weight) and $\dot{Q} \approx 29 \times 10^4 \text{ kcal/sec}$.

With these assumptions, with a total duration of the expedition of 14 days, a journey from the earth to Mars would take only 111 hours, with a conjunction of planets and an interstellar leap height of 2.10^3 [km] ; the total fuel load for the round trip as well as a 100-hour activity [?] on the surface of Mars would amount to 285 [kg], and at the beginning of the expedition a maximum cooling accomplishment of $\text{ca. } 29.10^4 \text{ [kcal/sec]}$ would be required. If one compares these estimates with the analagous rocket-technological studies, there is revealed in extraordinarily drastic fashion the superiority of the principle of dynamic contrabarie to the rocket principle.