399 A

II

THE RENAISSANCE OF MIND AND BODY

THE GRAMMAR OF PHYSICS

1.	The	Scient	tific	Grammar	of	Michael
	Fara	aday's	Diar	ies		

- 2. A Physicist's Work Sheet
- 3. Experience versus Experiment
- 4. The Three Dimensions of Time

5. The Real Mind and The Real Body, or, "The Nature of The Physical World"

I. The Scientific Grammar of Michael Faraday's Diaries

For sixty years, the managers of the Royal Institution of Great Britain held in their care the daily manuscript records of the researches of Michael Faraday (1791-1867), leading physicist and chemist of the first half of the nineteenth century. The sheets cover more than four decades. He was in the habit of describing each experiment and every observation inside and outside his laboratory, in full and accurate detail, on the very day they were made. Many of the entries discuss the conclusions which he drew from what he observed. In other cases they outline the proposed course of research for the future. Thus this diary is supplementing our general conception of science. We sometimes are inclined to look into a science not our own as into a catalogue of results. In Faraday's Diary, it becomes again what it really is, a campaign of mankind, balancing in any given moment, past experience, present speculation, and future experimentation, in a unique concoction of scepticism, faith, doubt, and expectation.

Therefore, our interest in this diary lies quite outside the range of propositions and proofs for any specific content or aim. It. centers round the logic of Faraday's mind, round the method of his strategy, both in thought and experiment. Seven thick volumes were printed a decade ago handing over to the general reader this diary for general use. What might seem merely a physicist's special theme, really may be used as a symbol of the true passions of the human mind. An experimental logic derived from this and similar documents will show that all Greek logic is an abstraction void of the sense for time. We never reason in the void of timelessness. Faraday thinks from day to day, against a background of older thinking, and antici-pating new facts of tomorrow. In other words, he thinks in three di-mensions of time; past, present, and future. Scientific logic becomes meaningless, when we dissect it and analyze any one of its statements or conclusions outside the interplay of past knowledge, future experimentation, present day speculation. The famous doubt of the scien-tist is the shadow cast on the past by the expectation of future better knowledge. Without this relation it would be sterile. Experiments are based on what he knows already. Finally he speculates because he has to pause between future experiment and previous knowledge. To reestablish the elementary fact that the human mind cannot think except in the three dimensions of time, is one of the most burning scientific needs of our age, so that the centuries of pure physics may be continued by an equally successful series of biological centuries. As long as we talk of the dimensions of space only, and use the obsolete and wholly unrealistic Greek and Roman tools of logic, the biology of the human mind remains under the spell of an irrational conception. Faraday, then, by his untiring faithful-ness in keeping his diary, contributes to our understanding the ob-jects of his scientific research in magnetism, electricity and light, but he also makes us understand the scientist himself, as a living subject, the mind in action.

The questions which we had in mind when we analyzed the seven volumes, (seven students in my course on "University Life, Past and

Present, A Philosophy of the "Sciences," helped me. Among them, Mr. Symons, from Phoenix, Arizona, did most of the work.) were for example, what was the driving urge behind all the steps of all the experiments. The wonderful humility of Faraday - he never sought distinction in so-ciety, always kept the faith of his Sandemian friends, a good Christian sect of poor people, - makes it possible to discard all external causes or motives. His inner desire, then, what was it behind so many failures and so few successes? For in forty years the blunders, mistakes, miscalculations, and wrong hypotheses far outnumber the lucky shots. This fact is so impressive, that it leads to a more general recognition: Sciences when not treated as a catalogue of results but as a process of collective action, are in fact a systematic and voluntary relapse into errors. "We must allow the scientists to err," said Pope Leo XIII. Science as a process is the organization of all thinkable errors in order that, as a later result, error may be overcome. No shepherd could survive, if he made one hundred part of the blunders Faraday made during his life. A shepherd's life can hardly forbear more than five per cent of error and experiment. It takes the complete isolation of a laboratory to give us the privilege of making mistakes at random. Now this voluntary creation of a maze would be unexplic-able were it not for the anticipation of something behind the confusion which is apt to reward us for this voluntary relapse into ignorance. The scientist is like a man who purposely marches many steps backward before he jumps a trench. Scientists- in the midst of their experimental avatar - must be able to know less than common sense and every day technique take for granted already. Why? Because they anticipate some unknown element outside our present day knowledge that will prove the narrowness of its diameter. Against a too narrow circle, their vision tries to enlarge the facts of interplay, relation, dependance and interaction. More unity of nature we may call the dogma of science; in this formula, unity is nothing absolute, and it has to be compared to the previous opinions on unity before it makes sense. The logic of science is a relative logic of infinite approximation. It increases relations, it unifies twenty experiences by chaining them to the triumphant chariot of systematic experimentation. Fifty guinea pigs investigated one after the other, cease to be fifty cases of murder. Fifty acts become one unified effort; in this way, experimentation is absolutely different from mere experience: It organizes experience by anticipating unity.

As Faraday exclaims: "Surely this force (gravity) must be capable of an experimental relation to electricity, magnetism, and other forces, so as to bind it up with them in reciprocal action and equivalent."

In this realm, then, of creating unity, Faraday speaks, as any complete human being, all the three languages of emotion, command and narrative. The emotions are those of wonder, admiration, and doubt or, against doubt, emphatic assertion. The imperatives are directed to himself. The narratives fix experiences.

Faraday's scientific grammar with regard to the imperative is simple: "<u>I must look</u> at Weber's result to see how they build in with these considerations and what the results are." Later he says: "<u>Astonishing</u> how great the precautions that are needed in these

delicate experiments. Patience. Patience." Probably a rare entrance in any man's diary, because so few people allow it to contain more than descriptions or analyses of feelings. Again he writes: "Want to try a mass of something to ascertain whether it will sensibly affect the directions of the lines of force of the earth - that it may ap-proach a step to the action of oxygen." In reference to an experiment already undertaken: "Have arranged a check - shall make this adjustable by hand. It is an important adjunct in experiments of observation." As an aid to his poor memory he frequently says: "Query these results." or: "Remember the dip." and: "Must clear all this up by further experiments." He may write: "The hypothesis is not so much mine as one renewed from old times. Look at Euler's letters and what he says. Look for cases to prove it." These Imperatives directed to Michael Faraday only lead up to more general rules of wisdom: "Let the imagination go, guiding it by judgment and principle, but holding it in and directing it by experiment." And the grammatical form of the imperative is not even used in this comforting sentence: "To point out or lead to a knowledge of what it either cannot explain or has not explained, is quite as important for the progress of knowledge as to establish what it can do." In the quotation on the unity of gravity, electricity and magnetism quoted above, he ends with a remark that is equally general and personal: "Consider for a moment how to set about touching this matter by facts and trial."

Since the diaries were kept primarily for Feraday's own benefit, they frequently betray his emotions of wonder and surprise. Thus: "I have been analyzing certain experiments in reference to the notion that gravity itself may be practically and directly related by experiment to the other powers of nature and this morning proceeded to make them. It was almost with a feeling of awe that I went to work, for if the hope should prove well founded, how great and mighty and sublime in its hitherto unchangeable character is the force I am trying to deal with, and how large may be the new domain of knowledge that may be opened up to the mind of man." Later he says: "After all, there is much which renders these expectations or similar ones hopeless: for surely, if founded, there must have been some manifestation of such a condition of the power in nature. On the other hand, what wonderful and manifest conditions of natural power have escaped observation, which have been made known to us in these days." When something unexpected would come of an experiment, his excitement would be intense: "But now came forth a new and striking result. Strange! Must find out the cause of this. What effect does this force have in the earth? His experiments meant more than technical proof to him:" It is exceedingly beautiful to see in all these arrangements how beautifully the lines of force represent the disposition of magnetic power." Or "Such beautiful delicate indicating curvatures." "The results are beautifully near and proportionate." Words of emotional description 'frequently used were "astonishing, I durst not, excellent, it was not easy because of imperfect eyesight, interesting, remarkable, curious, I begin to despair."

In his scientific grammar, certainty and doubt, naturally alternate. "Surely this force must be capable.." he said in the sentence on gravity. Of some conclusion reached he might write: "Hence this method seems defective in principle, or at all events in sensitiveness;

and yet it is very sensitive. Certainly there was no hopes for any optical results since there are none here. I think Plucker must have been mistaken in his result and that my old observation was right." And again: "I think that I may trust the reality of these negative results." At times he is quite positive and says: "I have no doubt," or "I have proof," or at least, "from all these experiments, I am led to conclude." More often than direct questioning he replaces his own conclusions, obviously vivid in his own imagination, stolidly with an appeal to the judgment of others. "I refrain from extending these views, as might easily be done, to the atomic theory, being rather desirous that they should first receive the sanction or correction of scientific men." or "I have refrained from all reasoning on the probability of the compound nature of nitrogen or upon what might be imagined to be its elements, not seeing sufficient reason to justify more than private opinion upon that matter."

II. A Physicist's Work Sheet

Faraday's terms, 'private opinion,' 'probability,' 'I shall refrain,' as well as the expressions of wonder and surprise quoted before, describe a state which lies after the Imperative and Vocative 'O Physics,' "There shall be a science of One Nature" with which we started.

We have moved onward to the second aspect of science for the man in the science who does the work in it. And we shall determine its character more carefully than the routine worker in it is willing to do. The second state of scientific grammar is not one of invitation, but of suspense. The experimental period of science is a suspensivus. It is this in relation to the mind as well as to the soul as Faraday's emotions clearly show. For the judgment is suspended as well as the feelings; the feelings are mixed; the judgment is said to be in doubt. But it is not a doubt in the usual clarified sense of black or white, yes or no. The quality of doubt during research is as mixed as the feelings. It is ambivalent, or as Kant called it, "tumultuary." For not two opposite truth combat, but a thousand and one, as many as in Leporello's famous aria in Don Giovanni. And it is for the mind indeed a similar situation as for Don Giovanni. The sus-pensivus creates, inside the time-cup of the command: let there be physics, a tunnel of longwinded work. This suspensivus may comprise one afternoon or the life work of whole generations. Its character is not changed by this difference in length of time. But its degree of consciousness very much depends on this difference. The founding fathers of physics alternated between the primeval vision: Let there be physics, and the suspensivus of one experiment here, one there. With the mass of modern physicists, it is very different. They think that a physicist is not a man who builds and tears down laboratories for specific experiments, but that a physicist is a man who works in a laboratory. This is a fundamental change in perspective. Faraday was a physicist as we shall see, even more outside the lab than inside. The workers in the tunnel of suspense called lab, think that the lab makes the physicist. Any profession thinks so. Doctors think of them-selves as being doctors because they work in a clinic. This is with any profession the result of creating an efficient environment.

Mentally, very soon, the environment ceases to be the product of our being doctor or physicist and we begin to think that we are the products of this environment. This has two consequences: First, the doctors inside the clinic begin to think that nobody can be a doctor, a real doctor without it. Second, they begin to think that the world in which they daily live is the whole world. Or at least the real world. I have heard a physicist seriously propose that the world should be finally run on a scientific basis in the way as he and his colleagues did their experiments. In other words, the goal of having the tools of a lab, now is made the goal first of the professional and second of a 1 1 life. As soon as the layman feels awe for the great achievements of the scientist, he too will think that the tunnel is the real world. And today, it has become everybody's ideal to transform the whole world into a laboratory. As a farmer arranges the whole world around a high price for his milk, so the laboratory worker finds fault with anything which is not "experimented with."

The physicist's routine work inside the time-cup of suspended judgment, one day, it is hoped, leads to an objective statement of fact. The public, therefore, awed by science, assumes that objectivity is a universal ideal. So, the laymen are inclined to see the result only and will not call a spade a spade and a suspense of a highly emotional character an emotional experience. To them, science seems to be the opposite of the emotional.

Faraday's diary illustrates the subjective aspect of research, the emotional strain of suspended judgment.

But of course, there is more than emotion on the subjective side. The subject produced in the state of suspense is as astrounding a product of the laboratory as any objective statement.

The war led me into a physics laboratory for 18 months, and since this was happening several years after the study on Faraday I was keenly interested in comparing my own work and the work of my students with the proceedings of a great genius. Our routines of today should be a great man's genius of a century ago. This, after all is greatness that it compels the later born to do likewise although in a less spirited way.

So, I shall reproduce here a regular work sheet and thereby take the reader in the midst of a present day laboratory for beginners in physics. This will explain better than all my quotations from Faraday the strange dualism in "lab" work. We shall observe the process by which at the end, two fruits are produced by faithful work which do not exist in reality but merely in experimentation: a new subject and a new object as the world has not seen.

The reader sees at one glance that the work sheet is divided into two pages. On the page to the right, he finds the term "data," with (A), (B), (C), (D), (E), neatly listed. On the left page, he finds scrawls. We who are grammarians, not physicists, and who believe in the compelling power of style, will now please concentrate on the difference in style of these two pages written concurrently by the same man during one and the same experiment.

The experiment has to do with spherical lenses, and a spherometer is used which, under (A) has first to be calibrated, that is tested for its own degree of precision. Later, the angle of refraction is measured. And at the end of the page, the result is stated.

We are interested not in the experiment as such or in its result but in the interplay between the two pages. The right page is employed for "data," the left for figures. In this, two processes are set in motion, the right page process towards creating objective result, the left page towards creating one unified subject mind. The data may be called data of <u>observation</u> since the term data means observations made by the five senses either on an instrument as to its readings or on matter as to its visible, audible, smellable, tasteable, touchable behavior. The figures are immersed in a process of <u>computation</u>. They are added and multiplied, etc. by "arithmetic" or "algebra" depending on the necessity of computing either figures or letters.

The two pages might well carry on top the two labels

从

* * * *

Observations

Computations

As the handwriting shows, the observer meets his sense data with a firm hand. He faces the facts of the experiment as one individual who meets other individuals. His statement is definite, his form of writing well defined. He stands at attention like a soldier on guard, fully equipped with his faculties of keen observation. But there also is caution. The reader finds under (A) and (B) that 3 or 4 different readings are listed. As a soldier on guard does not shoot before he has asked several times, so the sense data must not be guess work. Science in an experiment repeats the readings. By this precaution, modern physics reverses the process of magic. In antiquity, the word or formula would be repeated three or four or seven times to make sure that it did catch the natural process. We do not repeat the magic formula, but the observation. We do not suspect the reality outside but our own senses. We check and recheck our data. The three or four readings of one and the same phenomena check our sense report of the external world. Hence, we have the right to say: One observation no observation. The isolated data is still "pre-objective." Only a series of data leads beyond mere impressions. Not one impression is a real data; the whole list is one. Hence, the reader of our sheet finds behind all these sequences of data a $\pm.005$ or $\pm.01$ cm (.39%) is the stigma attached to the senses. Pre-objective impres-sions never are perfect. A margin of error remains. And by this mar-gin of error, the whole list of observations is still off the ideal mark of perfection. Ideal science can only deal with reversible process which can be repeated. For, in an experiment, unique processes can never be objectified.

Three steps are taken: a single impression on a sense of our body, a sequence of such impressions is formed; an average is taken with a possible error of so and so many per cent. This means that the primitive single sense reation is thrice removed from true objectivity.

Now, we pass over to the opposite page. At first sight, the style stands revealed as dramatically opposite. The hand which was so definite and firm on the right page, has moved hastily and nervously. It is not tied down by the horizontal and vertical lines of the sheet. It runs in more than one direction. Most computation sheets look even more ghastly and criss-cross. Is this accident? We do not accept this escape. In style, anything spontaneous has the weight of substantial truth, of a telling fact. Any work sheet, by the way, in hundreds or thousand of cases, produces the same effect.

Therefore, we have the precious evidence of the grammatical dualism which is operative during the period of suspended judgment. The left page is the subjective page. Computation is a purely mental activity. And because it is, the bodily phenomena which accompany it, show not a man on guard and at attention, but relaxed, indifferent to appearances, introvert in slippers. For the grammarian, mathematics is not a question of content but of form. What is computation doing, in this wholly introspective process on the left page?

We find, for instance - the reader need not fear that he has to figure it out himself - the equations $R = \frac{.2525}{2} + \frac{(2.57)^2}{2(2525)}$ and R = 13.20 cm + .13 What does this represent? the two fractions of the first equation, one at single power, the other to the square, have been reduced to one expression. Well, "what of it," the objection may come; "this reducing is our daily bread." But this daily bread of physics by which he reduces different expressions to unity, is as admirable and as mysterious as real bread. Could it not be that the daily routine blinds us to the transformation's full significance?

Something went overboard, for unity's sake, in the reduction. It was treated as ballast. In this special case, it was, among others, the term "to the square" in $(2.57)^2$. To reduce to a common denominator means to sacrifice a nomen, an expression, a particular name. Mathematics redefines its expressions so long and so consistently as to achieve the greatest possible unity of expression. The mind on the left page, sacrifices expressions, and there may be as many as a hundred of such mental sacrifices, on one page.

What is the net gain? The subject who at the end, says 13.20 cm, although in his private life he speaks of inches, has sacrificed his historical vocabulary and nomenclature. By this purification, he has become one mind with all other people who compute, all over the globe. His mind now is a so-called transcendental ego, a mind detached from place and time. Place and time always are limited by names with their local and temporal associations. The transcendental Ego who emerges from our left page, is detached from his native and social attachments, and owed allegiance only to the republic of physicists. In this republic, a special language is whispered, the language of mathematics. This language because it is a secondary language, is not spoken but moves by signs. Also, being secondary, it is nameless. But it is meaningless unless it emerges from a primary layer of speech. Mathematics on the left page must receive something which they can reduce. Or, there is no room for its proceedings.

Let us assume that on the right page the data were partly measured in inches, partly in centimeters. On the left page, we then would read the reduction of inches to centimeters or vice versa. In this manipulation, it would be obvious that one expression, "inch," or

"centimeter" was sacrificed to the victor. But the expressions $\frac{.2525}{2}$ and $(2.57)^2$ are two "expressions" in no less degree than inches and centimeters. All expressions are Names waiting to be sacrificed in the quest for unity. If they were left to themselves, they would remain inaccessible to each other. We have to reduce them by <u>cutting</u> off the head of one of them before they can be incorporated in one statement: Computation requires amputations.

Incessantly, computation sacrifices expressions for the sake of unity. While magicians sacrifice people or things in honor of their sacred names, science prefers to sacrifice man's pride in his expressions, his pet names. This certainly is a cheaper sacrifice. But it is a sacrifice just the same. I have given the history of the decimal system which was introduced by the men of 1789, in my book "Out of Revolution." It certainly is a most dramatic conflict between two sets of values, one scientific, the other social. However you side in it, it is a real conflict because names deserve to be kept, at times. Reducing Dante and Milton to a statistics of their verbs, in the data of their poems, may be valuable. Mario Prat has reduced d'Annunzio's famous poem L'onda to a string of quotations from the Italian Dictionary which the "poet" simply had versified. But these reductions are irrelevant in genuine poetry for the simple reason that in poetry, the names are relevant.

On our work sheet, the right page is the page of resistance to reduction. As resistance is needed for an electric current, so the right page is the impediment for the reduction. The sense data listed here, are the minimum of resistance offered by the world of objects to reduction. The sheet says: Unless you honor every one of my data, your reduction will be worth nothing. Do not reduce too early or too few facts. The suspense, then consists of the resistance offered to reduction by the materials present in the experiment.

But, that means that the time element of an experiment is expressed by the dualism of the two pages. They obstruct each other for a while. And during or for this "while," the sense data of the physical world as perceived by the body on the one side, and the subject mind linked to all other detached minds by his figures, on the other side, <u>are divorced, as mind and body</u>. The allegiance of my mind to the republic of computation in which we are all of one mind, and the allegiance of my five senses to the sense data around them, produce a rift fn me. Because the experiment takes time, the time in which body data and mental reduction, resist each other, our attention is drawn to this conflict of body and mind. And when many men undergo such experimental training and experience, they begin to divide their own being into body and mind. But they mostly overlook the fact that it is not their own body and their own mind which are separated, in the scientific process. Our two pages tell the true story of this whole division of mind and body. It is perceptible only when the mind enters

into the fellowship of other minds, and when the body bends over and attaches itself to matter, to other bodies, as their pure organ of sense registration. Man, in a scientific experiment establishes two specific fellowships: one for his senses, one for his mental powers. Truly suspended like Prometheus on the rock, the scientist may not descend from his suspended and outstretched position between sense data and computation before he has not bent the two worlds of mathematics and of material physics to each other, through his power of reducing one to the other. Mind and body are means to an end. Man divides himself into mind and body, temporarily, for a specific purpose. And the purpose is to force the world of the senses to admit of a unity in figures.

When we now sum up the goings on of the two pages, we may write:

Left computation goal: Unity of expression means: sacrifice of names, reducing to common denominator status of the mind at the end: one detached mind united with all other detached minds.

situation: mental, subjective insistance on agreement through figures Right observation goal: complete data means: repetition elimination or admission of possible errors, constant checking state of the senses: pure receivers of the objective data, the body of the observer serves as part of the bodily part observed

situation: physical, objective resistance to agreement of the individual data.

During the suspense of the experiment, the mind all the time becomes more of a mind; the body the more faithfully we observe, becomes all the time more clearly the body. Objects and subjects do not exist, but are polarities produced in the action by which we split inside temporarily for the purpose of uniting afterwards more consistently. A given diversity and a desired unity contradict each other in the beginning. The physicist undergoes voluntarily, for the sake of solving this dilemma, a cleavage inside himself.

But, then, it is fair to give him the honor of battle scars. If it is the scientist only who drives this wedge into himself because his mind sacrifices all the names dear to his heart or habits, and because his body becomes a mere tool of observation, then it is he and he alone who lives in this division of mind and body. And he lives in an unreal world, in the world of the laboratory. This world is unreal since the people with whom we live have names which cannot be reduced. And the things which we must use in the real world, cannot be checked and rechecked. I cannot marry five times although I can calibrate the spherometer by five readings. Why? If I marry five times, I have never been married really.

In the real world, the stripping of names is forbidden, and the arbitrary repetition of actions is forbidden. Since I only live once, I must treat this life as unrepeatable and irreducible.

Your irreversible Science is our power over all things which are reversible. The division in mind and body, is a wound, a fission, a distortion suffered for the sake of science. A bridegroom, a soldier, a daughter, must ignore this division. The division in mind and body is not a natural fact of our existence. To the contrary it is a sacrifice of man's nature, Oneness, Wholeness, and organship, a sacrifice required by science. Now let us return to Faraday.

III. Experience vs. Experiment

In the laboratory, the description of his experiments is more or less a sequence to his own arrangements. Evidently these descriptions then, are no pure, unpremeditated narratives. All laboratoryfacts are man-made, i.e. secondary experiences. Lest we exclude the best and most immediate source from which to know his power of narrative, and the delicate way by which a vigorous impression was trans-formed into expression, we must turn to the pages of the diary where he tells of unexpected phenomena in the street, or on the sea shore. Of course, they are much longer than the short imperatives; however, we should keep in mind that, in the system of thought, one short command: 'patience' equals a long tale about the past. Retrospection is bound to be long; the plunge into the future is its very opposite. Here, then, follow some examples of descriptions: Experimenting one day with chlorides he writes: "Not with Magnesia; only chloride and proto-chloride produced. There was a fire on Thursday evening in Broad Court, Anny Lane. The clouds were low and received a strong illumination from the fire beneath them. The angle taken from the top of the Royal Institution by a quadrant formed by the clouds, the Institution, and the fire, was 24°. Hence the height of the clouds will be....equal to...." Again spending the day in the laboratory deep in chemical analysis he says: "Phoenician coin analyzed- is composed of copper and silver. It was a small cast coin weighing about 120 grains, having a rough white surface but brittle coppery fracture. It contained no lead, tin or antimony. The design was bold and well pre-served and consisted apparently of characters or symbolic marks. A whole bag of these coins were found at- and were bought for a pound." Still another day he walks out of his laboratory and sees: "At Folkestone the atmosphere clear and fine view of the cliffs of Dover. Soon after sunset (the wind being about S.S.W. so as to blow on land) ob-served a cloud forming just the brow of Shakespeare cliff. It streamed inwards, increasing in size, but all seemed to pour nearly from the same spot; the air which came from over the sea there taking on a visible form and passing in to the interior as a cloud. By degrees the generation of clouds took place along the whole line of cliff from Dover to Folkestone hill, the wind still carrying the portion formed over the land. We ascended the cliffs about $\frac{1}{2}$ a mile beyond Folkestone hill about an hour after sunset and found all above developed in dense, moist mist, so as to deposit water on our clothes; the temperature also low to the feelings. We walked back towards Folkestone and on descending a little way down the hill by the road emerged from the cloud and found all clear beneath. The cloud was extended a considerable way in land, covering the tops of the hills. Was not this effect produced by the cooling of the surface of these hills after sunset by radiation into the clear space above, and the

consequent cooling of the moist air brought by the wind from the sea below its point of deposition?" Again the next day, his lack of departmentalization allows him this entry: "At times when the wind has been rather strong, I have frequently watched the gulls who were fly-ing over the waves looking for food, and have often seen them move slowly against the wind or remain stationery facing it, balancing themselves on their wings but without flapping them. This has lasted for 1, 2, 3 or more minutes, and I think could not be due to any previously acquired momentum because they would suddenly sweep round, going down with the wind, and then again return against it, all with-out flapping the wings; I have also remarked hawkes over land advance in a similar manner in similar circumstances, without having been able to detect any motion of the wing calculated to support them. They seem to remain suspended in the air by an apparent balancing of the body on the wings against the wind. How do these birds fly? And why may not a man or a machine fly in the same way in the same circumstances?" A year later he returns to the same place. And again has the opportunities of remarking the balance of the gulls in strong wind: "Many of them would rise together and there seemed to be a sort of emulation among them; all had their heads to the wind which was here parallel to the cliffs ... Perhaps the effect which may sometimes be observed in flying a kite may be connected with this subject. Sometimes a kite when badly rigged will, upon rising, not cease to ascend when the string forms a certain angle with the current of air, but will continue to mount, taking nearly a horizontal position in the air, and that till the string is nearly vertical when the kite generally falls over and comes down." At yet another time while in his laboratory making experiments on light...." and then oxide of zinc seemed fixed and unchanged by the high temperature produced." Suddently this paragraph is inserted: "John and George Bonnard being in a hay field where many large cocks of hay were, had occasion to notice the effect and progress of a powerful whirlwind; it took up the whole of a hay cock, raising it in the air, whirling it around and expanding it over a space 6 or 7 times its original diameter and then letting it sink a little in advance on the neighboring ground or trees. It is evident that the progressive motion of this whirlwind (and the same with most of them) was not due to the advancement by a general wind of that portion of air which was first put into rotation but that of a general mass of air; nearly quiescent, contiguous portions assumed the rotating motion in succession, so that when the air over a haycock had rotated and taken up the light matters beneath, its motion gradually ceased whilst the neighboring parts revolved and the just raised hay fell again." Again later, he leaves his laboratory: "This evening a magnificent aurora borealis occurred. At 11 o'clock it was like a powerful clear twilight or the break of morning from behind a low ridge of dark, picturesque clouds towards the North West to East North East and 40 or 50 degrees in height. Sky otherwise clear, wind from the south west but slight in power.... A fine, broad pillar of red light gradually formed....after innumerable changes the light both as to color and intensity, the whole gradually assumed the appearance of faint columns or rays...dancing or flashing perceived. It appeared as if part of the sky towards the zenith suddenly glowed with a phosphorescent light.... A remarkable fact relative to the lines of direc-tion toward the one spot south of the zenith was that, even when the blush did not proceed along them, but across them or simultaneously

over a large space, still they were visible and apparently as fixed in their position as ever." And once more: "A beautiful aerial phenomenon observed about St. Paul's Church, from the shadow of the dome, and the part above cast on very thin clouds moving at that height. The moon at full and rising.... The effect was very beautiful. Many persons went away fully convinced that rays of darkness were issuing from the church. Time about 8 o'clock."

The classical case for this respiratory process between experience and experiment occurred when a friend gave Faraday a large Leyden jar. It was broken by a shock of electricity in an experiment. Instead of bewailing the loss and discarding the jar, he proceeded on an intricate series of new experiments to determine why and how the electricity broke the jar. He made drawings of the break, and though thoroughly excited by the accident, he conducted his series of investigations as if he never had planned anything else.

William Blake called division the sin of man; Faraday was a great man because he was utterly undivided. His whole, very harmonious, very well balanced, to be sure, still his whole nature, and not a brain, a slave of the intellect, was at work through the years; though we owe his diary, partly at least, to his one weakness, his unreliable memory, it reflects the rare character who immerged completely, soul as well as body, into the intercourse with his world, and used the brain in the limited way in which it is useful, and for those ends for which it is given us. On the basis of imperatives, emotions, and narrations, he built up his few but precious speculations. Their simplicity rivals with their forcefulness.

Words frequently used to express doubt and speculation were: "It has occurred to me, perhaps I am in error, it would appear, upon consideration, I suspect, would this imply, I think, I believe, a correction needful, at times it seemed so, it is not sure, I want clearly to understand, suppose that this were so."

"I am learning how to observe." "I have not found it so." "The point will require investigating." "This does not accord with the facts-; but I want more and more distinct results, and only reason thus to preserve under the disadvantage of a sadly failing memory the ideas that I may want to reconsider hereafter. The facts, as far as they go, are I believe good." He balances his explanations even in the moment he is formulating them for the first time: "Many interesting points would arise here for consideration... Is the diminution permanent or is the full charge restored on lowering the temperature? Either answer would be important in the consideration of the nature of steel magnetic charge." Or he faces the negative: "I think that I may trust the reality of these negative results. The whole day almost in vain; for after the end of it all discovered a source of error which vitiated all the results and also those of yesterday - but it was well to know the error. No wonder the results of yesterday were incomprehensible." Or this: "So now I believe that all the effects I had heretofore obtained were due to the falling or rising loop of wire and not to any effect of gravity. At all events, we are purifying the inquiry from interfering causes." Cancelling his efforts, he might write: "Of a sudden all wrong and I see not why."

We gave his statement on gravity before: "Surely this force must be capable of an experimental relation to electricity, magnetism, and the other forces, as to bind it up with them in reciprocal action and equivalent effect." This faith in the unity of the elements com-posing different phenomena is called today, with an understatement, working hypothesis. The term is not exact; because it suppresses a number of essentials that such a faith must contain in order to make people work. It is, then, not a hypothesis for the objects, but an imperative for the subjects who do research: It makes them work. Again, it does not make work one man or another; to the contrary, such a subjective assumption is not the faith required by science. It must be a faith that may be shared by many, eventually by all scien-tists. For that purpose it must be in accordance with the main dogma of science: unity of nature behind all the phenomena. And even here the faith does not end. It must reach people not as individuals, one, ten, a thousand. It must make them cooperate in an integrated division of labor. We use the word faith rightly in all instances where people of different thinking and convictions cooperate. A child and his father, a police man, a farmer and a scholar, may have the same faith, though this faith is reflected in their brains in completely different concepts and words. Science is able to make cooperate catholics and mechanics, students and Nobel prize winners, because a common faith distributes the functions of workmanship despite all differences of rational formulation.

Faraday was a classic because the faith into the unity of nature came to him not as a heresy, but as the precious acquisition of two centuries, with the certainty of a social code, embodied by his master, discoverer and promotor, a member of the best society, Sir Humphrey Davy. The son of the blacksmith who was Michael Faraday, was not asked to fight the prejudices of the upper classes; he was invited to share and to advance their living faith and their most sincere and valuable endeavors. This fortunate constellation produces the classic, the type of man who is allowed to add to the trends of his times the integrity, strength and harmony of one especially well organized individual. We shall see, in the second case here under consideration, how unique Faraday's position was, how rarely society and individual are in the balance embodied by Sir Humphrey's pupil.

It needs scarcely saying that in our own days, scientists begin to assume so much power that they are threatened by the same cancer that kills any powerful group or clergy, simply by imparting power.

The classic serenity of Faraday is equally far distant from dawn and sunset of the day of science. By the absence of any fighting element in his mind, of any attack against the pre-scientific age, or of any self-defense of professional claims for power, in the whole diary, Faraday's life proclaims the hours before noon when the domination of the new sun is ascertained already; however, the zenith of science is not quite completely reached, the light is still united and concentrated, not diffused in the thousand colors of the afternoon sun.

Here are some more short expressions of Faraday's faith. "No doubt a larger law of action would bring both or all three cases under

one expression, but still that would not as yet show that bismuth is diamagnetic." Or: "Still, I think there must be some relation between these functions of light and electric forces." Again, he speculates: "Universe magnetism. Earth, Sun, Moon, probably all lie as mutually related magnets in common medium of space. In view of media, may very well speak of atmospheric magnetism in relation to earth."

"This space or state of space is new to our knowledge. So also is the space filled with lines of force new to our knowledge, i.e. to the knowledge of philosophers generally." About another phenomenon he muses: "Time in relation to magnetic force- probable existence of a medium; if time concerned, it will most probably be exceedingly short like that of its relation to light, and so perhaps for ever remain insensible to us." "If considering the reasons before given, there be the least hopes of finding the time, these hopes ought to be verified or exhausted. Can that be done thus?"

And so we are led on to two utterances; one is connecting the whole universe of man's mind; - and let it be clear that the problem now is enlarged from the different departments in the individual mind of Faraday, emotions, dreams, volitions, memories, and ideas, to the more complex stage where mankind must survive as undivided whole, with science, art, religion, and legislation as immense units and organs of life.--- And the other is bringing together the external universe into one dynamic system, united in the way Laotse spoke of the unity of the wheel produced by the one point in which there is no wheel.

I. "If there should be any truth in these vague expectations of the relations of gravitating force, then it seems hardly possible but that there must be some extraordinary results to come out in relation to celestial mechanics - as between the earth and the moon, or the sun and the planets, or in the great space between gravitating bodies. Then, indeed, Milton's expression of the sun's magnetic ray would have a real meaning in addition to its poetical one."

II. "The Aurora borealis may now become connected with magnetic disturbances and storms in a very distinct manner; and if the variations of the atmosphere cause both, it will also tie both together by a common hub."

The last paragraph of Faraday's daily report on his work bears the figure 16,041. And one of his last public utterances was: "for all the phenomena of nature lead us to believe that the great and governing law is one."1 16,041 and One -- this is the great paradox of his life, faith, and grammar. "When we consider the life work of Faraday it is clear that his researches were guided and inspired by the strong belief that the various forces of nature were inter-related and dependent on one another. It is not too much to say that this

In "The Correlation and Conservation of Forces" by E. L. Youmans, New York, 1867 p. 376. See further W. H. Bragg, Michael Faraday, 1931 p. 22 and 25. T. H. Gladstone, Michael Faraday, London, 1873 S. 123 ff: "His Method of Working."

philosophic conviction gave the impulse and driving power in most of his researches and is the key to the extraordinary success in adding to knowledge."¹ As to 16041: "A good experiment would make him almost dance with delight." And as to One: "The Contemplation of Nature and his own relation to her, produced in Faraday a Kind of exaltation."²

IV. The Three Dimensions of Time

It will be our final task to establish the "respiratory process" between the 16,041 and the One as the most important contribution of the diaries to our understanding of the mind in action. For 16,041 reasonable doubts, we may say, were experienced, considered, tested and cleared against the background of One faith.

Before deepening his meaning of his respiratory process, we must listen once more to Faraday himself. For he knew that the mind in action, his own mind, differed from the mind outside the body of science. "What a weak, credulous-incredulous, unbelieving-superstitious, bold-frightened, what a ridiculous world ours is, as far as concerns the mind of man. How full of inconsistencies, contradictions and absurdities it is. I declare that taking the average of many minds that have recently come before me (and apart from that spirit which God has placed in each) and accepting for a moment that average as a standard, I should far prefer the obedience, affections and instinct of a dog before it."³

Therefore we should try to view his lucid and keen mind against the society in which he as a scientist had to live. In his later years, a committee inquiring into the state of education, asked him, with many distinguished scholars, to express his opinions on the best training of the mind. The report, long forgotten, would deserve a complete reprint. Since our specific purpose is to show the isolated existence of a "classic," in the midst of the society of his day, one paragraph may suffice.⁴

Faraday stated that he had not the "training of the mind" usually expected from regular education in the classics and continued:

"The phrase 'training of the mind' has a very indefinite meaning. I would like a profound scholar to indicate to me what he means by 'training of the mind' in a literary sense, including mathematics. What is their effect on the mind? What is the kind of result that is called 'the training of the mind'? Or what does the mind learn by that training? It learns things, I have no doubt. By the very act of

- ¹ Lord Rutherford in Report on The Faraday Celebrations 1931, London, 1932, p. 39.
- 2 John Tyndall, Faraday as a Discoverer, London, 1870, p. 186.
- ³ Letter to Schoenbein, July 25, 1853, ed. by G. W. A. Kahlbaum and F. V. Derbishire, London, 1899.
- 4 From Edward Livingstone Youmans, The Culture demanded by Modern Life, a Series of Addresses and Arguments on the Claims of Modern Education, New York, 1869, p. 463.

study, it learns to be attentive, to be persevering, to be logical, according to the word 'logic'."

"But does it learn that training of the mind which enables a man to give a reason, in natural things, for an effect which happens from certain causes: or why, in any emergency or event, he does, or should do, this, that, or the other? It does not suggest the least thing in these matters. It is the highly educated man that we find coming to us, again and again, and asking the most simple questions in chemistry and mechanics; and when we speak of such things as the conservation of force, the permanency of matter; and the unchangeability of the laws of nature, they are far from comprehending them, though they have relation to us in every action of our lives. Many of these instructed persons are as far from having the power of judging of these things as if their minds had never been trained."

Finally, in his observation on Mental Education, Faraday himself turned toward the analysis of scientific judgment. He showed the beauty of "errors" if they were to be considered honest efforts between a dark, ignorant past and a more enlightened future, and defined error as "a presumptuous judgment." rendered too early.¹ We are now, I think, in a position, to state our most important result.

In the grammar of this scientist, doubt, reasonable and experimenting doubt, retains its place between the great certainty with which he marches into the future and the seamfree aloofness towards the past and its social routine. The scientist is freed from the responsibilities for routine and repetitive work. In the case of Faraday, this delegation of an experimenting mind by society worked beautifully, because his loyalties towards this same routine--society, his certainty of faith into a promised future, and his equanimity in his present stage of doubt, all were in perfect balance. Our faith into the future plus our loyalty towards the past are the parents of legitimate scientific doubt. This parenthood separates organized, scientific doubt from all scepticism or cynicism. It reveals what any "present time" of a civilization or a man really is. The present time is not the result of the past nor is it the 'cause' of the future though this is the most current fallacy of our era.

This deserves our special attention. In natural science, it is true, the objects are treated as if the future depended on the presence, according to the famous formula of Laplace: "We ought then to regard the present state of the universe as the effect of the anterior state and the causation of the one which is to follow." (Theorie Analytique des Probabilités, Engl. Translation 1902, p. 3.) Only, what is true for the objects of natural science is meaningless for the living subjects of science. They are able to do research, to be puzz; ed by "problems," to wonder, because they are driven towards a future goal that lies beyond their personal physical existence. Science is possible because man knows that his body is bound to die. The most important fact that we know of, every individual's physical

I In Lectures on Education before Prince Albert, especially p. 47.

death, is not a fact of the past or of the present but of the future. It has been said rightly that the root of all our knowledge is to be found in this prescience because it forces upon man the distinction between that part of him which is bound to pass away and those other elements of his existence which are not finished by this future event. "The future is the basis of our present evaluations," exclaimed the rediscoverer of the future, and its logical function, Friedrich Nietzsche.¹ It is, of course, an insight that has always operated; however, natural science, by looking backward on recurrent processes of the past, found no motive to mention this law of subjects. And our times, saturated with natural science as they are, ruin the very conditions of a prosperous natural science by carrying over to the subjects the rules that apply to objects only.²

The misunderstanding about the dependance of science on the power exerted by the future, and the pressure brought to bear upon men by our prescience of death, is a very serious one because it deprives the scientists of their dignity. On the other hand, it must be admitted that there is one particular reason why science in process should put aside this relation between the future and its actual operations. We don't know the future in the same way we know the facts of science. We know all facts of science because we know that we must die. Our belief in this future event is the basis of our scientific work in the field of matter. But we never must mix this belief with our method of research. Science is perverted if any rational concept of this future event would enter our thinking. When we die, where we die, all specific fears and hopes about the material realization of the future, must be kept out of our speculations. No scientific thought must be stained by speculations upon the material shape the future might show. Otherwise, prejudice, predilection, fear or hope would bias the scientific experiment. In this sense, the process of science is of that divine integrity of which Shakespeare speaks in Troilus and Cresside (IV, 5). Here the Greek king bids welcome to in Hector, his enemy, for half an hour of complete armistice and mutual enjoyment. He praises the divine integrity of the extant moment in terms that sound as though they recall the happiness which we relish whenever we are steeped into the freedom and solitude of scientific research.

> "What's past and what's to come is strew's of husks And formless ruin of oblivion; But in this extant moment, faith and troth, Strain'd purely from all hollow bias-drawing, Bids thee, with most divine integrity, From heart of very heart, great (nature), welcome."

- ¹ Nietzsche, Werke XVI, 359.
- ² Some remarks that point in our direction, may be found in William Stern, Allgemeine Psychologie, Haag 1935, page 386 f., 551, and, with special application to the method of science, on p. 770f. The principle is stated in Rosenstock, Soziologie I, Berlin 1924, and in Angewandte Seelenkunde, Darmstadt 1923.

Lest we misinterpret this welcome given to Hector by Agamemnon in a breathing spell between two battles, it begins with the significant pair of future and past: "What's past and What's to come." This should put us on the right track. It is from just this fact that both future and past are put aside for a moment that the interval which we call presence and which Shakespeare more rightly calls "the extant moment" draws its thrill. Science is the sublime freedom of man to surrender to his astonishment about the laws of life in face of the fact that his physical death is rapidly approaching and that the past is unalterable. It would be strange indeed, if this place of the scientific effort as a half way house between journey's end and journey's beginning had escaped notice among the scientists. Therefore, we need not be surprised that the first clear statement of scientific method is quite outspoken in this respect. In a famous passage, René Descartes tells us that he considered himself to be placed in three simultaneous domiciles, patiently recognizing his loyalties to the social past, fervidly believing in a final solution of nature's secrets and in the meantime consecrated to the pursuit of scientific doubt. Here we have the half way house of the scientific laboratory, of the scientific mind in the midst of its campaign. We may say then that Faraday and Descartes are in complete agreement as to the three tenses into which human time must be divided.

Any present time is created by a reaction of our faith in the future upon our loyalties towards the past. The presence is that portion of our life that we by our feeling certain about the future, can wrestle from the repetitive and recurrent part of our system, that portion won away from the laws of gravity so that we become free to grow, to add, to be changed. The present tense is a delicate product of a struggle between the pull from the future and the push from the past. The pull from the future is represented within a group or an individual by their beliefs. The push from the past is represented within their mind by consciousness and knowledge of facts. We said at the beginning of our investigation that the grammar of a scientist should lead to an understanding of the three dimensions of time. By an analysis of Faraday's grammar, and that is to say by an investiga-tion carried out in a great center of the scientific process itself, one old long forgotten truth is re-established that mankind's future and mankind's past both precede its present tense logically. What we call present, is a result of the struggle between future and past. A mechanism has no future and therefore no present. It exists as a repetition of the past. All mere recurrence belongs to the past. Science itself is not repetitive. The mind itself is alive; that means, it does not belong to the merely recurrent processes. Faraday expressed this, in his own language, but with great force when he said: "Electricity is often called wonderful, beautiful. But it is so only in common with the other forces of nature. The beauty of electricity or of any other force is not that the power is mysterious and unexpected but that it is under law, and that the taught intellect can even now govern it largely. The human mind is placed above, and not beneath it, and it is in such a point of view that the mental education afforded by science is rendered super-eminent in dignity."1

¹ Silvanus B. Thompson, Michael Faraday, 1898, p. 185.

This term "Law" is pointing to the recurrent past, "above" is Faraday's term for our 'alive'. Man, being alive, is suspended between future and past. He is able to create a present, as an intermediary stage of transformation between believed destiny and innate fate. The present tense is a state of tense pressure between destiny and nature, finality and causation. Any one scientist fills this state with his doubts, his transforming ideas lest the ends that attract us from our goal, be missed by too narrow and too casual Causation. Any "error " any "preposterous judgment," indeed, is endangering the fullness of our life, because it narrows the accessible means for our ends.

By discovering wider and deeper causes science eliminates unnecessary defeat and retreat. It is able to predict the equations of force and matter which supply us with the means for life. However, these predications have nothing to do with the 'future' of civilization, the destiny of mankind, the goal of creation. Science only predicts the encroachments of all <u>lawful</u> processes upon his future. It can't wish to predict our future since that would deny its own vital importance. Michael Faraday's contribution to our knowledge is just that unknown quantity which makes prediction of the full future impossible, and science would defeat its own ends if it undertook to predict what difference its own achievements will make to society. "Faraday believed the human heart to be swayed by a power to which science or logic opened no approach."¹ Naturally, he must hold this belief. For science originated when modern man put his heart into settling in the present in the form of organized and cooperative doubt. He hereby tried to keep the vital balance between the believed future and the known past by enlarging the past and all its predictable processes infinitely.

This campaign of science was worth a big sacrifice. For, let us now remember our chapters on the Hieroglyphs and the temples. Were we not filled with awe over the underwriters of the sky, in the temples of Egypt when the morning star and the Sun met to proclaim the year of eternity? How should we not admire the last milennium from 1050 to our own days in which science has made one world out of all these skies? This is the fruit of the readmission of "mind" and "body": man by joining all minds as a mind, and the physical universe as a body, has unified the world. Under the hands of science, the world has become physical, and natural.

"Nature" is the skyworld of skyworlds, the sky world to the square so to speak. This higher power of our concept of nature became possible by the mind's resolute detachment from the body's immediate self interest. The ancient skyworld's power over men was political and economical. For this reason, any one of these sacred worlds was confined and became a prison of the mind. The academic mind went outside the gates of any one city of man, any immediate problem of feeding and organizing the millions; and by this unselfishness, he forced the real world to yield its secrets to him. Disinterested interest was the strange passion which made the mind master of the natural world.

¹ John Tyndall, Faraday as a Discoverer, London, 1870, p. 185.

So foremost was this on the minds of modern physics that the triumph of physical geography, that is the system of longitudes and latitudes for the whole globe, was stated in these terms: "The system involves nothing that savours of the peculiarities of any country; in so much that the Commissioners observe: that if the history were forgotten and the results of the operations only preserved, it would be impossible to tell in what nation this system had originated."1

Here, the gospel of the Renaissance is clearly stated: National local, native language cannot describe nature. If we wish to make the globe into one "Nature" for all men, we have to use a language which is neither national nor native. It must be a language which is general and universal. Such a language must not savour. And since all living beings savour, it must not be a living language. The language of science is instead of savouring, an <u>abstract</u> language. Its figures and signs are not meant to be spoken.

To be general, to be abstract, to be free of any living substance or nature, gives us the power to get outside nature and to calculate it. For gaining this victory over nature, we must have broken its spell over our soul by its names or connotations or associations. This radical separation from our attachment to the native soil, the national lore, the religious tradition, is the real piety of science. By being loyal to its one goal of unifying the world, science has freed man from his immersion into the world. The ancient world commandeered man. To us, however, the world has become "that which changes," not that which commands. Nature could be defined as that which changes according to law in the eyes of the classics, in a chaotic manner to the eyes of the most modern physicists. Both Newton and Bertrand Russell, however, know only of "that which changes," as their domain. The net result of the Renaissance is this sharp line between that which changes and the elements which can be identified amidst the flux as surviving the change: We ourselves are eminently beings who straddle change. We know of night and day, death and birth, superstition and science, decay and progress. And in this one feature, we are unnatural.

It is the merit of the Renaissance to have pursued nature into its last angles and corners, until the natural is absolutely separated from the non-natural. Nature is that which changes within one space continuum, within infinite space. By the trick of placing all the skyworlds into one infinite, yet calculable whole of space, science has envisaged one space. As bodies, we are immersed in this natural cosmos. But we can only <u>say</u> so and can only <u>know</u> this to be the case because "We," belong to a fellowship through time in which all men are one man despite the flux of change. We therefore may end this search for the nature of physics with a new and better definition of Nature and man: First proposition was, Nature: that which changes;----Man: he who survives change. This produces already unity of the natural world as against the ancient sky worlds who were plurals. Second proposition: Nature is each time taken by itself. We are "all-times-at-once."

1 Out of Revolution, New York, 1938, p. 206.

In nature, each moment is outside each other moment. "We" do not give up before we have synchronized all moments. Nature buys its space continuum at the price of a time-discontinuum. Man establishes one time continuum at the price of his individual, physical transiency. If there is one nature, there is also One MAN who marches over this earth and lives under this sky despite all indications of nature to the contrary.

V. The real mind and the real body

By now, the way opens to a radically different assessment of the meaning of "mind" and "body." All Renaissance thinking pretends that it has no "place" for the mind. By looking on our worksheet once more, the "stylist" may be able to "locate" the mind better than the logician.

Both pages were written by the same man. We admit that he and any scientist - tried hard to make his mind meet all other minds and to make his body link up in the most perfect cohesion with the rest of the material world. But the man in splitting himself dutifully, did not succeed completely. The mind and the body both have scribbled and written. In both cases, left and right page, the same hand moved over the paper. The same fingers clutched the pen. The same shoulder turned. His eye looked at the writing. His elbow rested on the table; his buttocks pressed the chair, in both cases. His feet dangled. Also, his brain was at work when he drew up his neat registrations for his sensorium as much as when he computes on the righthand side.

How can this state of affairs be overlooked by logic which glibly speaks of mind and body as though they were two? Does this make sense in view of the facts? The same person used the same faculties when he registered as a body and when he computed as a mind. Is it a blind prejudice to continue this talk about mind and body? No, it is not blind because we, too, have seen a decisive difference of style, of handwriting and of the whole man. In slippers on the left page, in parade uniform on the right. A division is undeniable. But the division is very different from the supposed dualism of a mind and a body, for me or you. What we really perceive, is ourselves in different styles of being. We are "mind," and we are "body," in alternation. And this is a true difference. But I do not have a body, but I am a body and try hard to be one, at times. And at other moments, I equally hard try to be a mind. (In the next chapter, we shall have to admit other styles, besides.) The same being, in both cases, is differently arranged. But it is all there. This explains the fact that hands, brain, buttocks, attention, fingers, are all present and in process in both situations.

We may now analyze the difference in simpler terms; the separation of mind and body is purely mythical, the myth of science. It nowhere gibes with facts. But it is true that when I try to be all body, as in an experiment or in sports, I am pressing myself against the windows of myself as though it were my railroad car so to speak and I absorb the landscape and try to be one with it. On the other hand, whenever I try to be all mind, I let the shutters down and begin to stare in the compartment of my railroad car where I only meet mental

pictures and where nothing from that which at this moment is outside, can enter. In other words, the hand and the brain are arranged in the opposite order. While I press myself outside the window of my compartment, my outer parts are placed first and in front. The mind follows in their wake like their faithful dog. This is an attitude of externalization, of mixing with my environment, of coming as nearly as possible to being part and parcel of the outer space.

The next moment, I do not try to exist as a body but I insist on being all mind; the inner man now comes first and my outer being as the handwriting showed, hangs slovenly around this inner cell.

Mind and body are tendencies of myself. Man at times wishes to withdraw into himself but on the way, he takes good company with him. At times, man wishes to get outside himself as best he can and again, it is as much matter around me which I then am willing to contact and to embrace. I am mind and I am body because I alternate between the inner fellowship with minds and the outer cohesion with the world. In science, these two opposite tendencies reach their ultimate limit. In science, I do not withdraw into the fellowship of some but of all minds. And this principle: of all minds, limits the luggage which I may take into this compartment, to figures. All minds cannot meet as long as any one of them speaks a purely national language. Science is the limiting concept for "Mind." The mind of science is pure mind, purer than any more limited fellowship. And the same relation of the ordinary body and the body of the experimenting scientist is found. In swimming, I may mix with the elements around "me." But in experimenting, I must mix with the elements as they surround everybody. The body is in a more universal world when I experiment than when I swim. The conditions of the experiment are so coordinated as to make its repetition by somebody else possible.

Now, the consequences of this restatement are considerable. If I do not have a mind and a body, but go in to be mind and go out to be body, the creation of this very alternation is the true and central action of a living being.

To be able to pass from the outside to the inside and back again, is the real crux of life. Never can I hope to be all mind or all body. My foremost attention must be directed towards being the door into both forms of being. "I," me, the person, man, is the threshold or the gates. And alternately I may take my elements into the inner or the outer world, by turning this way or the other. But "me" is both, the ego of the mind, and the It of the body, in interaction. Me is more than the I, or the It because it also is the a n d, the hinge between them. And by rediscovering this quality of a hinge, we may find our identity with men of other civilizations. This identity seemed to be forlorn, during the Renaissance of mind and body because the men of other civilizations always stressed that man was the hinge or the gates or the doorway, the passage between two spaces. This seemed a superstition when we heard this of the Chinese or the Egyptians or the Eleusinian mysteries. But it is no superstition; only since they had a limited world, a sky world where we have the skyworld of skyworlds, one universal nature, our arrangement is better. It is the most radical arrangement as we have seen, among all

the arrangements of two spaces one of the mind pointing inward, one of the body pointing outward. Among the many possible gateways between an inner and outer space, natural science is the only universal gateway. But although an optimum solution among its equals, it still is their equal in this distinction of two directions mastered by us. The world of outer space does not any more exist than the world of the mind on which we insist. Both are our arrangements of two spaces.

As Faraday expressed it lucidly (p.18): "The mind is placed a b o v e " the outer space, and this "mind" is a whole second world formed by all the minds in society delegated to cope, as physicists, with the three-dimensional, physical realm.

But this means that one day, a community, called "We," decided to turn toward outer space and toward an inner space, at the same time, in such a manner that a certain group among us would move back and forth between the two spaces in alternation. And we know of the pure qualities of the two spaces only by this appointment of this group of officers.

The thesis of physics that space consists of three dimensions: length, width, height, makes sense only within a society to which the space which is examined by the physicists, consists indeed of three dimensions, but to which, at the same time, the space inside which the physicists keep each other company and communicate in their scientific monographs and systems with each other, does not form a part of this space of their objects. The space examined by physics is only one of the two spaces postulated by the existence of a science of physics. In the one space, the objects of physics are found, in the other, the scientists develop their theories about the objects. The science of physics presupposes two spaces although she herself investigates the facts of one of the two spaces only. Hence, the space of Mr. Einstein or Newton, is not "the" space, but one twin-space. For, by the very act of observing an outer space common to all men, the physicists differentiate another space, in the same breath, with the help of which all human minds may be identified and treated as though they were one mind. And it is from this second space that society expects to receive Mr. Newton's revelations about the Nature of space.

No physicist can do research in the one of the two spaces unless he first believed thoroughly in the creation of this inner space, too. He cannot become a physicist unless "we" send him to the laboratory, the second space, first.

A beautiful proof of this dualism has been given us by Eddington; He gave us a book with the remarkable title "The Nature of the Physical World." We now shall devote our attention to an analysis of this title because as grammarians, we do not care for his theories but all the more for the names which he uses naively. And nobody is so easily tripped up about his real beliefs as the man who gives a title to a book of his. Titles always demonstrate the author's religion. All book titles do use words as names. And to name - we already know this - is to believe.

In The Nature of the Physical World, Eddington has acknowledged

that physics builds up a world very much like the sky-worlds of antiquity. For, his title is based on the existence of "Gates," of a door which leads us alternatingly outside into nature and inside into physics. Through this book title, physics recovers its relationship to the sky worlds of Egypt and China. And since these skyworlds admittedly were the fruits of a whole community, we may expect that we shall discover the parallel dependance of modern science on the faith of the whole community or society of our times.

That sounds like a big order. The logician will say: "What's in a name? How can you press any title to such an extent? Perhaps, it was the publisher who invented the title."

We shall see that this would not make any difference. The title speaks to the general public; if an author allows his publisher to speak in his stead, we still have the fact that a book title is a bridge of names connecting the world of science with society at large.

And the exciting and rare beauty of the title, "The Nature of The Physical World" lies in the fact that it is as absurd, as mysterious, and as revealing, as all names. For, in it, three synonyms, World, Physics, Nature, are used. When we come to think of it, they all mean originally one and the same thing. Nature could be translated by World. Physical, in Greek, means natural. Is, "Physical World," a limitation of World in general? How can this be since physics embraces everything natural? Shall we assume that Mr. Eddington believes in a "metaphysical" world besides the physical or in an unnatural world besides the natural? If we can find out why the Anglo-Saxon word World, the Latin term Nature, the Greek term Physics are here mixed together by an intelligent man, we should be able to read or to decipher the real story of the Renaissance. In isolation, the title The Nature of The Physical World, would hardly give away its secret. But once our attention is aroused, we shall find innumerable similar coordinations of one Anglo-Saxon, one Latin, and one Greek term which literally all three mean the same thing. "Physics," World, Nature, once may have meant the same. They no longer do, thanks to science.

In anticipating the result of the following comparisons, I shall now catalogue the different meanings acquired by the scientific method, of world, nature, physical.

1) World - the Anglo-Saxon term - is "The World" into which we go before we really know it. A man goes into the world. This world will be full of surprises, full of riddles, even horrors and fears. Before I have become a man of the world, I shall not understand the world. She does not speak my language. I do not feel at home in her. Since the world does not speak my language, it is unpredictable.

3) Physics, Physis, Physical - these Greek terms are used when we have succeeded in making the world speak, The World which holds no secrets any more, is physics. This physical realm is predictable and tested by experiment.

23a

2) Nature - that is the Latin term - is the "middle man" between the word used by the layman and the word used by the experts.

Why should there be a third term? Why did Eddington not call his book: The Physical World? If we can find the reason for the existence of a third term standing in the middle between the Anglo-Saxon and the Greek words, world and physics, perhaps we would get rid of the dualism "Mind" and "Body," too. Because we might find that it is a third form of myself who speaks and writes of "Nature," neither the mind nor the body. We may indeed identify the man who asks for the Nature of things as the man on the threshold, in the gates between the two trends of going out and turning in. For, Nature is the world not yet examined but already to be examined. He who says: Nature, no longer is panicky or hagridden or driven or escaping from the world. He has turned towards Nature confronting her, ready to face the music whatever the result of such facing the facts might be. But, on the other hand, the result of such a confrontation is not yet known. The ciphers of the processes are not yet deciphered, the figures are not yet all in. Therefore, nothing as yet can be definitely predicted. Nature is the threshold world which describes man's <u>turning about</u>

(continued on page 24)

23Ъ

towards a part of the chaos around him with the courage to confront it. Nature is the turning point at which we erect the doorway between an external impression and our inner reaction, a turning point which says: so far, we as individuals have been made to run; now we as a group pause and look around and $r \in f l \in c$ t before re-acting. The term Nature makes room for an inner space of reflection. It balances the native term World which now describes the previous state (as we say: He is in a state when we wish to say that he cannot face the Nature of a situation) and the hoped-for term physics as the result of scientific reflection. This fundamental reflection valid for all we call research.

In the three terms "World," "Nature," "Physics," we have one and the same reality, in the three phases of its treatment by us. The invaluable book title "The Nature of The Physical World," is, indeed, indebted to three aspects of one and the same object which refer to each other like past, present, and future. Therefore it is a meaningful title. The same topic appears in its three phases: Before being faced by us, it is "world." For we are still scattered; we have not yet turned. When "eyed" as a problem, as a mental task of the whole group, it is "nature." This means that its spell over us is broken; we need not react blindly. When finally conquered in a scientific technique, it is "physics." The title, "The Nature of The Physical World," describes the mental processes by which we tame the w or 1 d by first aligning as a group and then detaching experts.

The tripartition of native, Latin, Greek is found for all our Renaissance sciences. Here are examples:

÷

4

Man, Humanities, Anthropology Husbandry, Production, Economics God, Deity or Divinity, Theology Numbers, Numerals, Arithmetic Healing, Medicine, Biology

**

The theologians know all about God. They talk of Him as though He could neither hear them nor refuse them. Theology treats God as dead. The Deity is a topic for philosophers, the Divinity is faced in Divinity Schools. And God, the Name who signifies simply, He who speaketh, is the power of whom we can say little but in whose hands and mouth we are. Or, take humanity, anthropology, man. Anthropology will describe every taboo, tattoo, superstition, habit and custom, every skull and skill. The humanities embrace some preconceived unity among these "anthropoi," heaven knows which. But Man is a dark riddle, a mystery, and the least we must say of him that he can terrify us by his crimes and vices, and make us very happy indeed by his love and friendship and trust. In this connection, it is an obvious objection to our thesis that textbooks overstep these delicate lines on purpose. The Anthropologist may write a textbook on "Man." The Theologians may predicate their theology "The meaning of God." This does not refute our sharp line of demarcation between science, in Greek, turning point in Latin, and pre-revolutionary or precritical attitude to God, Man, World. For, we only have to ask on which term the

authors of these popular books with their alluring Anglo-Saxon titles base their and their publisher's claim to sell. The theologian thinks that we will buy his book because he is a theologian. Mr. Linton has written his book, and Miss Mead hers, because they are anthropologists. And Eddington wrote his because he was a physicist. Hence, in back of the popular term they may use, the real term which author-izes them to speak, still is the Greek of their science, anthropology, theology, physics. The difference becomes clear when we ask how a real prophet would write a book on God. He would try to erase the notion at the start that he was a theologian writing "about" God. He would try to re-establish the fact that God has spoken to him. Hence, the one term which he would have to shun like a hot potato would be theology. And the next term would be "Nature." No prophet will write on the Nature of God, no singer of the majesty of fire as Wagner in the Walkuere can speak of the Nature of Fire. It is not an accident that in the last sentence, we spoke of the majesty of Fire which impresses the artist. The difference in height is in fact constitutive of the three phases, world, Nature, physics. The Fire, the World, the Gods, the mysterious Man or Woman to whom we submit as elementary influences, are higher placed than we ourselves. They drive us; we do not yet drive them. Hence, we look up to them as we do look up to the World War, the World Revolution, as very big indeed. When we say, the deity, we are on speaking terms with God. This is the whole dif-ference of the terms Theism and Deism that Voltaire as a Deist could lecture God quite a bit; on the same level with God, or man, or the world, feels he to be who says Nature, Humanity, Deity. The turning about and facing the overwhelming force, makes me its equal. And again, another level is established by the scientific process. The physical, the anthropological, the theological material is at our mercy. We are above it. It is material for our masterminds. In three steps, we climb a staircase. From being lower we get even, and finally we stand above. This 'above' of the mind, Faraday saw.(p.18)

Our explanation is the first ever given or tried for the strange usage of higher, above, superior. We say "overwhelming" and we say manipulate and manage. And there can be no doubt that these are actual terms for levels. But nobody has ever tried to show how they come about since in the outer world, high and low do not exist. They are produced by our own mental attitudes. AND WE cannot help passing through these three attitudes of service, equality, manipulation, all the time. We must be awed by fire, question its nature, and study it chemically. Not one of the three phases is truer or better than the other.

The taming of the shrewd world is a perpetual process. It constitutes the living process by which we move through the past, present, future. We bestow, to be more explicit, these qualities of "past," of "present," of "future" on the universe. When Milton sang: The World was all before them, he taught us that Man, God, World, earth and fire, heaven and hell were to be expected, feared, hoped for, as future, as unknown.

Human, natural, divine, numerical, ignition, globe, celestial is our human present day task. When God is with us here, we call him by a Latin term, Divine Providence. As theological, arithmetical,

physical, pyrotechnical, geographical, anthropological, these same things are left with the experts. The topic of any expert profession no longer bothers the general conscience. We always find that a thing left to experts is of second rate importance because to some degree, it is solved. Peace: we have officials. War: the thing is not soluble by experts. The less soluble, the less expert action suffices. The World is before us. Nature is with us. Physics lie behind us, on our triumphant march of progress.

Not one of these three tenses could be omitted. If we wish to have any future, we must allow for all the three tenses. He would be a degenerate indeed who could not say: O world war, O destruction, and nihilism, let's not go on with them. Come to our rescue, nature of war itself. Reveal us to us in your proper nature. Turn around. Realign with us. And where before your fierceness has nearly destroyed us, serve us from now on as a tool, after we have understood thy nature.

It was, then, not a superstition but a scientific act when William James asked for "A Moral Equivalent" of War. The Latin term moral equivalent is a typical turning point, in such a search. We are not now concerned with any practical solution of James "facing" the very force which usually only was decried as "horrible," as "solving nothing," by the run-of-the-mill pacificists. William James at least asked: Who are you, Mister?

And in this volte face, we may re-unite with our oldest traditions. That the Egyptian astropolitician did exactly this when he entered the gates and asked the very powers of desert, flood, sky, burning sun which before had simply made the tribesmen react blindly, we have seen in the chapter of the temples. But the gates there on which the sign of the Union of the two lands was placed, the secret door, the Janus through which we go out as well as in, may not have impressed the reader as compelling our own thoughts. But they are. The relation of an inner and an outer space on which our mental peace depends is not given but must be produced by an act of faith on our part. It is a revolution because we have to turn round. It may still be a hard thing to accept that the oldest prayers of Man and our own search for an end of world revolutions, or world crises are met with the same "technique." Nevertheless, I will take the risk of comparing one of the Oldest Roman prayers with our own situation. This prayer has received much attention lately when Eduard Norden lectured on it at the Harvard Tercentenary. He traced it back to Greek origins.

I scarcely have to say once more that the gap between the old prayer of the Arvales Fratres in Rome who prayed for the safety of their fields, the arva, to the God of War and pest and plague, Mars, and the research of modern science, is very great indeed. Granted that it is, one point which we have in common with the old Romans, may be frankly admitted. This point of comparison is the turning around of the human group to face that which as long as it is not faced, swamps us and drives us.

In the Latin prayer, the God, at first called with the duplication of dramatic intensity Marmar instead of Mars, is seen ravaging

the flocks and the fields. He is when the song begins, inimical and hostile. He is asked to come in from the open spaces, and in the central line, he is implored to "leap upon the city's threshold and to turn around and act as the defender: "Leap upon our threshold, stand there firmly." This re-alignment accomplished, victory becomes possible He, Mars himself now shall call the other Gods to our rescue, "Triumph, Triumph, Triumph, Triumph."

The three phases, before the confrontation, in the invocation, after the God is harnessed, are clearly discernible. In the central line, the God is given the name which is the right name, that is to say, his true nature as Mars, is established. It is in this Nature, that he can be made to leap upon the threshold, the Limen, between the chaos outside and the citizens inside the precinct. And it is for this strange process that we introduce the old ritual. The process of all human spirit stands disclosed. The power which has driven us, is the means to our triumph after we have made the critical revolution.

Certainly, the Romans were primeval, primitive. But they were not superstitious. An ominous and sinister power outside their ken was conjured up although it was greater than they. In daring to name it, it could be placated. By naming it, they felt that already they had to some extent ligned it up on their own side. The same Mars who a moment before was felt to bear down as a giant on their fields, when invited upon their threshold, is already the ally and associate. And the final victory in the last part of the prayer results.

Such an old prayer is not quoted in vain if it helps our own blunted reason to recover its creative power. Not by accompanying the trends but by turning in a courageous "let go" and relaxing the grip on us, do we rise to the occasion. We create a change in the world if we have the courage to rename it. Science is not description, but contradiction. Unless we speak this one word, we are overpowered by things as they are.

The hinges in which the door of "Nature" swings and by which any part of experience may become manageable, is our own speech. We speak and the world quiets down and licks our hands. But this right word of ours is not found without our stepping on a place between "the world" on the one side, and "ourselves," our minds that is, on the other. It takes a change of mind to establish such a new threshold between the outer and the inner. The whole man, body and soul and mind in unity, must jump outside the pressure. This is an act of faith, not of argument. It is a jump. With physics so far advanced, we have difficulties in realizing this action which must precede any new science just as the constitution must precede any particular law. But if we look upon our human riddles, revolutions, wars, crises, heartlessness, madness, we find an infinite field still waiting to be defined by a new approach. And as long as we have not dared to turn around, we still face destruction.

What of it, you may say? Why not turn? If this is all, why

can it not be done immediately? It cannot. Because the secret of the threshold lies in the fact that we must build these thresholds in each case together. The Arval Fratres were the priests of Rome. The Republic of scholars was world-wide, or has become world-wide. The right name for the God of War must be race-wide. The physicist may be a specialist, the anthropologist may consider himself nothing but a scientist. But the society which allowed them to become physicists and anthropologists instead of burning them as witches, had to admit them, had to call on them, had to support and to read them. The Renaissance of Mind and Body was possible when the souls of men became willing to admit it, on faith. The Readmission of the natural sciences which we call the Renaissance, was an act of faith by the people of the Western World. It took martyrs of this faith before it was admitted. And there is no doubt in my mind that these world wars were needed before the peoples of the Western World became ready for a further change of mind. Common sense, observation of trends, description of facts, will never build up further sciences. It always will be the same threefold phasing: pressure of chaos, a courageous and unselfish, in fact self-forgetting, turning around, and only then, science.

Sciences are not born by mental activity, but by acts of faith, in the pressure of chaos. For they must be born before they can be known by their fruits. And the seed of knowledge is not knowledge, but its opposite. The faith which builds science, says: I am overpowered and I am ignorant, but I am not afraid. And any science which is so solidly built that it forgets this origin in the whole of man, will soon bear no fruits. It is not the mind and it is not the body who have created the Renaissance. The body and the mind have put themselves at Man's disposal when he asked them to help him or when he volunteered himself to play their roles temporarily. We shall see in the next chapter that war must be explored neither by the mind nor by the body, because war is not waged by either mind or body. But if the whole man invites in such a new Strategy of war and peace, he will find other aspects in himself with which to experiment and to work and these will serve him as well as mind and body do for his exploration of physics.

The Renaissance will be followed by another great RE-ADMISSION. But this time, it will not be a renaissance of "Mind and Body" because the experiences to be made are not made by either the mind or the body. The experiences of a world crisis, a world revolution, of decadence or of war, of madness, of cruelty, of peace, are inaccessible to mind and body. We shall find that an old American prophet has proclaimed two prospective forms in which alone social chaos can be registered, a century ago. And the next chapter shall deal with the next great RE-Admission of former ways of life. This time it will not be the Classics. It will be primeval man who may teach us something about integration.

At the end of this chapter on the grammar of physics, we should place on record our two discoveries squarely: 1. The creation of Nature is the human creation of a skyworld of skyworlds, of the one world which all minds can share through computation. 2. The approach to such a scientific world is not done by straight thinking as

concomitant to observed facts. It requires an interplay of three steps. The individuals are impressed by chaotic conditions. The community makes a stand to slay the dragon of chaos in unity and turns about. The special sciences manipulate the "material" of their various fields which the common faith has cut out for them.

By the two discoveries together, we are compelled to make a lasting distinction between the three responses:

Response by the individual
Response by society
Response by the scientist.

We found that the artist eternally represented the response number 1. The scientist, of course, took care of number 3. We have not yet assigned a group or a type of speech to the attitude of 2. Who does the turning and who says: Nature, Humanity, Deity, "After" world, Man, God, but "Before" physics, anthropology, theology?

Can the Arval priests' Carmen help us? Here, the City of Rome forced the power of war to turn around, to leap the threshold and to line up with them. They projected the terrible power which terrified the individuals outside themselves; then they faced it together. Finally, they harnessed it to their chariot of triumph. The power of war at first seemed to victimize every animal, it then inspired the group to a common approach, it finally yielded its spirit to the city. On all three stages, the power Mars remained outside of us. Man was the victim, the conjurer, the protégé of the god. Obviously, we do not share this belief in the purely extraneous character of the spirits and powers. In this respect, the old Carmen differs. Before our era, fire, war, earth, heaven were personified and each held therefore a personal domain. We no longer believe in these independent personal gods or neoplatonic essences or departmental principles, dominions, powers, spirits as the ancients. Our god is the father of all spirits and the person of all persons and the principle of all principles. And our own soul is the creature of all creatures and can creatively realize its essential identity with the whole of creation. We are the arch-creature and carry a trait of every creature and are moved by one breath of every spirit. Everything is represented in our own nature. Hence, when we are driven panicky by any life force or deathforce, we do not pray to this force because it is not an essence or person or god outside ourselves. Instead, we try to suffer its being part of our own nature and we undergo it as part of ourselves. For instance, we shall confess that we are partly "war" ourselves. This takes the place of the personification Mars.

When Herman Melville who wrote the American language on the three hundred year meter band, exclaimed:- in Pierre: "It's speechless sweet to kill you," he abolished Mars as a god outside of us. He appointed himself the victim and the priest of a society destructible by war. For, spirits a r e at war with each other all the time. Any spirit of any time fights and ridicules the spirit of a previous era. How have we poked fun at the Puritans: "It's speechless sweet to kill another spirit." And it is a spirit embodied in the man killed whom Pierre wants to execute.

The solution of our troubles with war, or any other shaking experience, lies in the one little word of Melville: "speechless."

All the difference of time and method in the Carmen Arvale and in us admitted: the solemnity of speech persists. To find a common name for the unspeakable, nameless, ominous and sinister is a task which has not changed from pagan times.

And society disintegrates when it does not recognize between the irresponsible individuals and the specialists a third wave length of speech on which names are not sacrificed as in mathematics but on which names are validated and made binding for the whole group. The word "science" itself is such a <u>valid</u> NAME. Today Peace, war, society, must acquire similar solemnity. There are names which must be valid before we can have any science. Although we certainly shall never again personify war or economics or science or education as though they were first principles or essences or gods, we shall have to revalidate names. Lincoln is a household word and it cannot be redefined neither can it be computed by a curve. This means that the next science will be not a science of words to be catalogued but of names, to be acted upon. The validity of names for the redintegration of society is the lesson preached to us by the sacred names of Science itself and of Mars in the priest's song, and of Lincoln, in our own public life.

Man does not become Man unless he recognizes in sacred names the imperatives of his own soul. The crude readmission of the speechless in psychoanalysis, nationalism, racism, communism, can only destroy us. This readmission must be coupled with the readmission of the community's power to name.