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Scientific Explanation of the World

English Contents & Abstract

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An English Abstract

I. THE WORLD BEFORE EMPIRICAL SCIENCE

1. The world has a form. This is a form of life of a living form. It is identical with living form. Living form is the form whose dynamics is a re-synthesis of itself. Living form accomplishes a dynamics of its re-synthesis and here lies its peculiarity as a living one. It stands out against a non-living background.
2. The living form is worlding the world. The world is finite as a life. The world is world in the background of the indefinite. Life is life against the background of death. The world stands out as order against the background of chaos. It emerges in the effort of mind and body to live by diminishing chaos. The world is individual and shared in one and the same living form. Thus human beings have one world and share their lives.
3. The categories of European (and non-European) ontologies pertain to a local description. There are no absolute essence in the world but it isn't elusive fire. The world is neither a given (Russell) nor a transcendental projection (Husserl). The world is neither being or non-being nor being-and-non-being. It possesses a quite specific reality hard to catch in words which escapes categorisation but yields to expression. This status is expressed by the Low of constancy of (transformed) energy. The world is not reducible to language and doesn't need a special reference to it.
4. Chaos as seen from the standpoint of life is an indefiniteness, vagueness and dissolution. In our world life i.e. order is always local and the non-living i.e. chaos is total. World 'rises from' chaos. It floats on the ocean of indefiniteness as the earthcrust floats on the ocean of magma. Chaos, as recognised by life, has a powerful expression in the Second Law of Thermodynamics. Entropy in the world augments indefinitely.
5. The living body shapes the world. The differences between worlds may be

seen in certain world as differences between bodies of living beings. A body endowed with eyes shapes a visible world. A body with an supersound perceiving organ shapes a supersonic world. A body with faceted eyes shapes a visuality different from that of mammals.
What living form experiences as a world is a horizon of possibilities for a resynthesis of this form (of its body). The body is a prototype of the world, its protoform.
The re-synthesis of the body in the flow of life is a re-synthesis of the form of the world.
6. Mind (not understanding nor reason) is focused perception (retentia, intentia, protentia) and in it's living process it grasps the world. Mind can stop its course (thinking) and become aware of the flow of time. Thus cleaned, mind doesn't experience pain and joy and keeps at a distance from the flow of the world in order to contemplate it. And this is to say that mind is somehow out of the world, out of space and time. According to Buddhism mind is eternal and extra-mundane and can be recognised in its primordial purity (enlightenment).
7. The world is obscure because it isn't clear why things stand this way and not otherwise. It isn't clear why there are the living and the non-living, birth and death. It is not clear why there are shapes and colours, space and time. Nothing is known about the 'possibility of the worlds'. Whether there is something beyond this world is unknown. Whatever we explain in the world we make use of its form which thus remains beyond explanation. Only the world's stability in comparison with finite human life lets us become accustomed to it and forget its miracle.

II. TIME AND SPACE

Time and space can not be derived, but they can be grasped as forms of worlding (living) world.
8. Perceptual time is real time and this is the time studied by empirical science. It isn't absolute and has its centre: the now living body. 'Time' is not an essence, but an abstract notion for the irreversible flow of the world as a life process. The Second Principle of Thermodynamics is a statement of the form of this flow and is therefore a statement of time. Life is flowing from past through present to future against the background of the world and with reference to it. Therefore the world itself flows from future through present to past. This counter-flow is the same thing as expansion against entropy, order against chaos.
9. 'Time flows' is a habitual expression. But time doesn't flow since it has no meta-time with reference of which to flow (endless regress or pure immobility). *Future – present – past* and the succession of earlier – later (MacTaggart's A- and Bseries) arise from the irreversible flow of life as a floating centered horizon.
10. Speculative reasoning about time is doomed because of the indefiniteness of the world with respect to reasoning. MacTaggart's analysis is emblematic. It 'proves' the non-existing of time, showing the way the flow escapes from logic. We cannot criticise, infer and refute perceptions by means of language, thinking and logic. An erroneous perception is recognised as such by means of another, clearer perception. Here the limits of logic and language are touched. This is the reason for paradoxes of the kind of Zeno's apories. The flow we call time voids logic and language.
11. The Second Principle of Thermodynamics is a statement of the form of this flow and is therefore a statement of time. Einstein's Special Theory of Relativity shifts Western ideas from 'absolute time' which seems to be close to common thinking, although depriving it from a centre, to a fundamentally different conception,

centred and oriented by the body: time similarly to space is determined and measured only in a centred system of reference. It is thus located in the 'biological arrow' – birth – death.
12. Physics studies perceptual space. Perceptual space is not absolute and has its centre: the here living body. The world is 'external' in two senses: with respect to the body and to the asymmetry of perception – creatures percept things. Space is irreversible, but not in the way time is. It is anisotropic, finite and is 'curved', i.e. shaped by the perceptor's living body. The horizon has a form and this form is perspective. Thanks to the form of perspective unlimited quantity of bodies are contained in the limited perceptual space.
13. Visual space 'diverges from the physical one'. Patrick Heelan develops a hyperbolic model of visual space in the context of hermeneutic phenomenology (Heelan 1983). He introduces a hermeneutic component of space. Although in depth distance and sizes diminish similarly as in classical perspective, they do it not on straight but on curved lines. This model is entirely consonant to the analysis of form in the preceding paragraph. But if a hermeneutic component is present in the form of space itself human beings would act and move in space in a way precluding ordering and compatibility.
14. Special and general relativity are statements of space. The curvature of spase in general relativity is a 'curvature' in terms of geometries, but it is the authentic space generated around the living body as a horizon. Special and general relativity are statements of an authentic perceptual form and are therefore statements of space. Geometry represents perceptual space as an idealised artefact.

III. STATEMENTS OF THE WORLD

Statements of the world do not carry it in themselves and do not represent it. In them we share it with our fellow-men inhabiting the same world. The world itself is not liable to representation unless 'representation' is meant as 'sign'. Photography and cinema do not represent but offer analogues in terms of light. To represent the world is to create its copy. Representations themselves are part of the world and draw energy from it.
15. Natural language is a form of concerted statement, of a collective description of the world. It doesn't carry the form of the world and its syntax is of no particular value. The world of individuals sharing the same living form is shared. Statements carry the form of collective life and do not represent the world. Sharing the world is accomplished as understanding of statements in a language perceptible by the senses, as mutual description and collective life in accordance with certain world description.
16. The world is articulated in the collective description. Collective description creates categorial schemes, grammars of the languages, division of the world in spheres, objects, processes, histories and meanings. One and the same perceptible world is divided in tribal descriptions and cultural forms. Thus in science are discerned a biological, psychological and social 'sphere of being', 'levels of organisation' and in religion the spheres of the holy and the profane, heaven and hell, virtue and sin. Thus the shared local description, common opinion, doxa is moulded. Science takes part in the doxa of contemporary world more than anything else.
17. Explanation has the mental sense of grasping. It is a meaningful text which unifies disparate senses. Explanation is plain-making, clarification, cleaning from unclearness. And this is to say: defining, strengthening definiteness, letting stand out. Explanation is local and addressed to one who needs clarification an to an unclear

situation. It is said that to explain is to answer the question 'Why?'. But it is thoroughly unclear why the world is as it is. There is no explanation of why there is a gravitation and why there is life. There is an explanation why e.g. this stone doesn't fall down and why that disease is a lethal one. To explain is to remove a tension, to fill in blanks in an image and to project an action. It paves the way of reasoning beings through the world.

18. 'Rational proceeding' has the form of expanding life. It is a local resynthesis of human form in a chain of operations and only for this reason of aims and rules. It hasn't the form of a practical logic. Rules are not completely defined. Following them is rational until they are exhausted. Rational proceeding is a synthesis of a problem solution. Rationality is limited. Rational actions are not exactly predictable.

19. Thinking is a living process of mind within living form. Its distance from the body allows it to create fictions. To be significant is to be situated in a life process. Understanding is a collective (intersubjective) recognition of human vital determinations (sense). Interpretation is not to be confounded with grasping of the world. The text is no world and has no life. The world is no text and doesn't speak. But man's creations are 'loaded' with sense and significance, enlivened by them and therefore liable to understanding.

IV. BEYOND 'LANGUAGE' AND 'TEXT'

We are comming back from 'language' and 'text' to the world without ontology. We need to grasp what science says about the world and not to interpret it's statements in any external context for to see how the scientific senses are born face to face with the world.

20. Philosophy has been expressing the situation of grasping in many ways. Neither is the True one. Any statement is problematic. Statements are local and situated. Therefore we are to refrain from peremptory statements concerning the world. And grasping doesn't provide us with a basis for a strict limitation of statements.

21. Perception doesn't divide the world into a psychic, physiological and physical domain. It stimulates thoughts without foundation, with a living sense only. The troubling dilemmas of 'theory of knowledge' like the mind-body question arise from a confusion of planes of perception and corresponding descriptions. Intentionality as an awareness of the self of an object is not a necessary form of perception.

22. Analytical philosophy has fallen into the pitfall of language and blocked its way towards living world. It makes the erroneous assumption that language mirrors the world, that the errors of metaphysics are rooted in language and that language can take the place of the world as an object of philosophy. In this respect they are on the same side as existentialism and hermeneutics. All the philosophy of the 20th century is burying the world under layers and layers of text and unwittingly substitutes living questions with dilemmas about language. But this is driving us away from language which is a language solely with respect to the world. It is time to break out of 'language'.

23. Getting free of 'language' means just to take it into its life – as a statement of a world. Language brings in indeterminacy with respect to the lived situation and piling texts over texts exponentially increases disorientation. Philosophy of science has to overcome philosophy of language without diving once again in the ocean of metaphysics. This is to be done by means of analysis of the living instances of

scientific sense-generation.

24. The world isn't a text unless we expand the meaning of 'text' until it embraces anything and loses any meaning. Of course we constantly are drawing into our life signs and other creations for the sake of resynthesising our social form. The hermeneutic programme in the context of modes of being-in-the-world is close to the analysis of science developed here. But it turns back to the fundamentalism of Heidegger's ontology.

25. The clarification of the world is possible on the prerequisite of a previously found, tacitly shared form of the world. Hence this form itself has to remains beyond clarification. In the flow of life mind clarifies the world for the sake of ordering it in the form of life. The world is in a permanent process of defining and re-defining. It is constantly being recognised. The unknown becomes known. The known allows action. The decisions to act are the portions of definiteness of life against death. The clarification of the world in the process of life is passing the thread of life through the interlacement of chaos. It is expansion of determinacy of things and events in space and time.

V. SCIENTIFIC MEANING AND 'SOCIAL CONSTRUCTING'

Scientific meaning does not come from outside. It is created in the attempts of insight into the world. Scientific culture is expanding unlike any other on the globe. Part of it are machines which are making human labour easier and raising our chance to live. Without conceptual strengthening humans are not able to comprehend the world as a whole in its quality of arena for rational action.

26. 'Episteme' is not 'objectivity', nor simple convention. Science is a quite specific form of culture. It has its historical beginning and probably its end. But it strengthens the shared description of the world unlike any other form known today and opens up a tremendous horizon for action. May be shamanism enables us to penetrate farther near the limit of the world or beyond it. But it requires a personal devotion and an intimate process of training. Science on its part is available at any point of the globe. Its operations are described and reproducible. It is sensibly pervading all collective description and action.

27. 'Theoretical entities' (unobservables) aren't real entities but they aren't pure fictions either. They are statements of boundary experience where perceptions are scarce. It is never clear what hides behind the theoretical unobservable entities. Their sense is clear only at the level of observation on the macro-plane where perception is possible. All unobservable entities are presented as perceptible objects in space and time which is an evidence of the collision between the theoretical macroworld and its perceptive macro-images.

28. The destructions of 'empiricist', 'rationalist' and on the whole 'modern' dogmas have a positive sense in the flow of world-life where no firm foundations are found. Scientific sense is not perceived by the negative characterisation of science with respect to the rationalist or empiricist model. It is found in the positive features emphasised by naive logical positivism rather then in its sophisticated refutation.

29. Society cannot replace the world. 'Culture' cannot explain science. The moon cannot be placed in heavens by the consensus of theorists. People cannot live better only by force of their local consent. Rorty is right that there are no absolute entities and that old oppositions like objective-subjective are inaccurate to the extent of perversion. But this is due to the finiteness of man and to the indeterminateness of his condition, not to cultural locality.

30. Allan Sokal. “The world is a social construction”, “Science is a game”, “Sciences are humanities” are statements characteristic of the post-modern wave which penetrated also into science. Here there is not a single new argument after Quine, Kuhn, Feyerabend, Rorty. There is here only an incredible publicity and expansion.

VI. CONCEPTUAL FORM

Scientific work is expansion of the definiteness of shared human world as it is perceivable by all human beings. It strengthens collective description by means of scientific description and explanation.

31. The epistemic field is a strained space whose core is conceptual form, whose potentials are scientific definitions, whose tensions are scientific questions an whose processes are scientific operations – answers to these questions: observation, description, explanation. Observation, description, explanation have different potential and establish a conceptual structure with different power: protocol, fact, law.

32. The conceptual form in empirical science is a crystallisation of definitions which have a perceptual sense in the epistemic field. The power of conceptual structure is its ability to organise experience by means of a synthesis of answers to questions. A structure is the more powerful the greater the perceptual diversity it is able to order in protocols, facts and explanations. Ordering things in science is similar to the growth of an embryo showing a wealth of new features and shaping itself in more and more detail. Science grows in preserving its form.

33. Carnap, Quine and Popper. The idea of a conceptual scheme passes through several metamorphoses in its course from logical positivism to critical rationalism and postpositivism. It starts as a linguistic framework (Carnap), goes through holism and ontological relativity (Quine), sociology of knowledge, incommensurability. From a positive explanation of the functioning of conceptual wholes it is turned into irrationalist ideology. Conceptual form is not a representation of the world. It is not probabilistically confirmable (Carnap), it is not a provisory prison subject to falsification (Popper) and is not one of the many versions required (Feyerabend).

34. Conceptual dynamics is an expansion of conceptual form into the epistemic field. This is a chain of answers to questions. The answers are parts of the unfolded conceptual form. The conceptual dynamics is its expansion. According to its power the dynamics strengthening it is observation, description or explanation (prediction).

35. In its dynamics conceptual form is being strengthened. Conceptual power is a degree of definiteness, epistemic potential. Strengthening is a break-through from data to facts (description), from facts to theory (explanation). The answers to the questions strengthen the conceptual structure in unfolding the pure structure by projecting it along the lines of force of the epistemic field. A conceptual form is the more powerful the greater perceptual diversity it can identify in a minimum of definitions.

VII. OBSERVATION AND DESCRIPTION

36. The observation is the first scientific operation. It puts perceptions into concepts. The position of a pointer is put into the form of value of a magnitude. Observation strengthens perception in augmenting its dividing power. Information is augmented. The world’s relief is being strengthened. This does not amount to an insight into a micro- or mega-world beyond the macro-world we are perceiving. All

the data of microscopes and telescopes are perceptible macro-objects. Observation has an artefactual organisation but its material is the world. The world is not dependent on any observation.

37. When the eye is equipped by apparatus it produces a magnified image. The definiteness of perception is raised. The microscope pointed at micro-objects and the telescope pointed at mega-objects are doing one an the same thing. They magnify the image. They don't change light-image into another type of image, they don't encode it in terms of other types of radiation. The light microscope and the light telescope provide macro-images of macro-objects. The electron microscope and the radiotelescope (or x-ray telescope) provide 'transformed data from electron and radio emissions'. This transformation is not an observed one. It is subject of theoretical explanation. Therefore micro- and mega-objects are theoretical objects, they are signs on the verge of observation, on the boundary of the perceptual world. There is no reason to consider the invisible as the same kind of object in space and time as the visible.

38. Neurath, Schlick and Popper. Scientists have no problem in identifying perceptions as their source of empirical knowledge. It is a philosopher's problem to define the 'empirical basis'. The logical analysis is according to its form analysis of language, and sense perception is an extra-linguistic phenomenon. The project of reduction to observation failed. But it has a sense. All of those problems could be solved had we to give up the 'basis' as a logical foundation. Language has an indefinite reference to the world. Perceptions are out of language and out of logic. Their statement varies and is theory-dependent. But there are no obstacles of principle in science for a consent about perceptions.

39. Scientific description dominates today in Western culture and in the world as a whole. It is an operation of a conceptual expansion strengthening pure structure in passing from data to facts. The descriptive question of the general form 'How do matters stand?' ('What happens?') is a strained gap in descriptive structure and requires a synthesis of a definition of a fact of the general form 'Matters stand in such and such a way' ('So and so is happening'). Description results from a matrix synthesis of facts from data by means of theory. Its result is an object and an event in space and time.

VIII. EXPLANATION AS MATRIX SYNTHESIS

The recognition of diverse phenomena as one and the same thing, e.g. of falling bodies and the moon's circulation around the earth as effects of one and the same 'force of attraction', allow single recognitions of phenomena of a tremendous range. In the above case Newton's law of universal gravitation defines certain form of the world without explaining why it is just gravitation that is inherent in this world and why it should be expressed with exactly this equation. The power of description and explanation is free energy saved by conceptual focusing of diversity into unification. Conceptual synthesis is a vital structuring with the same sense as any other re-synthesis of living form, restoration of human life and its expansion.

40. Explanation is a conceptual dynamics, a research operation by which the cycle fact – theory – explained fact is closed. It answers the question 'Why (what for) do matters stand this way?' and puts into play a theory or a spatial model. Scientific explanation is an organic ordering in science on the highest energetic level. Explanation in science conceptually unifies vast numbers of types of fact.

41. Scientific explanation doesn't explain the form of the world, it

presupposes it in its process. Explanation makes use of a law (a constant relation between values of magnitudes) or spatio-temporal form (constellation) – a local mundane form. What explains is the perseverance in time of mathematical relations between magnitudes or the perseverance in time of spatial from.

42. The covering law model (CLM) is a logical model. It rests on the ontology and logic of the necessary, the universal and the singular. It demonstrates an expansion of definitions from the 'universal' to the 'singular'. It formulates an analytical procedure of inference of a fact to be explained from explaining laws and facts. The model leaves out the acts of synthesis in explanation on which its possibility rests: the synthesis of a law, the synthesis of a network of facts and the synthesis of an interpretation of facts by the law (subsumption). The model is based on an wrong 'ontology' – that of universality. CLM leaves out 'functional' and 'inductive' explanations.

43. The matrix model issues from a different 'ontology' or rather from the rejection of any ontology. It clarifies explanation as conceptual strengthening. Explanation changes the weak descriptive conceptual structure into a powerful explanative one. This is accomplished by means of conceptual synthesis of a matrix kind. It answers the question 'why' after the question 'what' or 'how' has been answered. It unifies chains of (disparate) facts. And for this purpose a logical inference is needed. For this purpose a rational synthesis is necessary. This synthesis is of a triple nature: synthesis of law accomplished in theory, synthesis of facts as a preparation for or first stage of explanation, and interpretation of facts by the law as a second stage of explanation.

44. There are two qualities representing in generalised from the power of explanatory synthesis: *empirical density* is the multitude of facts explained, and *simplicity* is the information ratio of the law with reference to conditions. Powerfulness of scientific explanation does not amount to objective truth. There are no exact laws not because of their approximateness but because of the abyss open between life and artefact. Necessity, generality, exactitude and completeness are qualities of artefacts and are devoid of meaning in perception.

IX. VERBAL EXPLANATION

It is no good to replace for the sake of explanation one chain of words with another one unless the second chain is clearer than the first one and amounts to a living process of problem solution. If a psychologist explains my pain with the word frustration this is consequential for his theories only, not for myself. From my own point of view to explain it is to deduce it from events I have had a living experience of and to determine which action would eliminate the pain.

45. Two forms produce two ways of ordering and two types of science: numbers and words. Two fundamental empirical sciences accomplish these kinds of ordering – physics and biology. Fundamental specificity of those sciences lies exclusively in the specificity of two conceptual structures and dynamics (orderings) – that of numbers and that of words. Traditionally they are designated as mathematical and qualitative theory. Physicists take qualitative statements to belong either to undeveloped science or to be of secondary importance. But the physical sense of magnitudes and laws is nevertheless given in words, not in numbers.

46. The word is an elementary sign, statement of a definition. It transfers a unit of meaning between people sharing one and the same perception and basic description. The word is a name when denoting a unique thing. Words are irremediably prior with respect to numbers. Asking 'how much?' is possible only

provided it is known ‘what’ is being asked.
47. A word pertains to terminology when it denotes a concept In science. In such a case a point with a given potential in the epistemic field of science is present. It is determined and fixed in an artificial sign – an artefact. It carries the sense of a conceptual and in the event of a perceptual definiteness. It denotes a magnitude provided a measurable characteristic with a wide scope is found. Magnitude brings us from word to number. The concept is more than a scientific term. But if by concept is meant an ‘essence’ somewhere out in ‘physical reality’ or in the eternal ‘Platonic world’ we have no business with concepts.
48. The scientific text is not an object of hermeneutics. It is variative and doesn’t depend on unique contexts. It connects variable terms according to constant rules with constant forms. Statements are true and false on a perceptual plane. The scientific text has a sense as a scientific statement of seeing and grasping the world. Rational proceeding lays the text down onto the texture of life.

X. INSIGHT INTO THE CELL

49. The descriptions of structures in molecular biology combine the chemical with the organic conceptual form. The discovery of living forms is the determination of some order in the space of the cell. It differs from measuring and counting which necessarily presuppose some uniformity. The ‘meaning’ of genetic ‘texts’ is the sequence of syntheses of proteins and hence the spatial ordering of living form. ‘Sign’ and ‘meaning’ in the cell are linked by encoding.
50. Identification of temporal diversity (description of a process as a sequence of stages) is the recognition of single items in a significant sequence. The description of processes in the cell combines chemical and organic form. In this way the steps of an algorithm or the phases in the synthesis of proteins are laid out. In space as well as in time units are organised by a common meaning. E.g. unweaving of the double helix of DNA, joining to each of the separated chains a copy of the other one and the production of two complete copies of DNA from the initial one is an integral process of replication.
51. Three features of the identification of a story are important: continuity, irreversibility, unpredictability. The historical fact is appearance and disappearance, birth and death. Historical change is development. The historical as compared to the dynamic is marked by development or creativity as opposed to mere change. The historical is something over and above dynamic and statistic interdependence. In living systems the difference between dynamics and history is hard to determine. Roughly, biological history is what goes beyond the dynamics of organisation – structure and function.
52. ‘Biological specificity’ or ‘biological sense’ is a meta-concept of biology. This sense emerges in the organic definition of concepts. To be significant is to play a role in the re-synthesis of living form. To determine the biological sense of a chemical or biological structure, reaction, function or act in biology is to determine their sense (significance) in reproduction (raising the chance for survival, adaptation and propagation).
53. Erwin Schrödinger. Biological specificity as an order from order as opposed to physical determination, an order from disorder is put to a brilliant analysis by Erwin Schrödinger whose lectures entitled What is life delivered in February 1943 at Trinity College (discussion of the difference between physics, particularly quantum mechanics, and biology) turned into an intellectual motor for research and discovery in molecular biology.

54. The historical case of the discovery of the double helix, the spatial form of DNA shows scientific discovery not as deduction or induction, but as the disclosure of forms on the basis of given traces as in criminal investigation. All relevant inductions and deductions are allowed. But no set of right solutions, of true interpretations exists, no false model is forcefully imposed.
55. DNA demonstrates that not laws or theoretical entities are really explanative but spatial forms and dynamics which lie at the roots of the matter. DNA is a boundary form. It is an artefact, but it is postulated as a real spatial form in contrast to macro-objects. It is indifferent to DNA whether it is an artefact. It isn't a theoretical entity, it is a spatial form – a solution to a whole range of problems concerning the re-synthesis of living form.
56. Organic theory is a theory without equations. It is a theory of living form as spatial order (structure) and temporal order (dynamics and history). This order is limited. It melts merely physical forms and chains of events into organic space-time of the re-synthesis of living form turning them into factors of this re-synthesis. Structures and processes acquire their sense from their involvement in this resynthesis. This sense recognised, explanation is accomplished.

XI. EXPLANATION BY NUMBERS

Explanation by numbers is a solution of an equation or a system of equations. A value of a magnitude is found by means of an equation (a law) and known values of magnitudes involved in the equation. Explanation by numbers presupposes a quantitative description, i.e. a network of known values where the unknown is to be determined. Such a description is possible only on the basis of measurement. Measurement has a perceptual content. Descriptive structure is constructed on the basis of observational structure and explanatory structure – on the basis of the descriptive one.
57. Numbers are signs, not essences. They are reducing diversity to sets of units. I.e. they strengthen the ordering of things and events as equal to one another, countable and measurable/commensurable. Numbers and the relations ordering them strengthen ordering to the stages of 'proportion', 'law', system of laws, mathematical theory. The number sign is a basic kind of ordering unit joined by respective ordering relations – mathematical constants. Numbers are artefacts, signs, types of text, types of ordering that have sense only in our life world and devoid of transcendental ontological import.
58. Number produces order by means of mathematical constants and variables. Number ordering has sense only in our life world and is devoid of transcendental ontological import. The creation of the mathematical theory of motion is a revolution in our knowledge of Nature. It launches a standard of rationality which is a synthesis of measuring experiment and mathematical calculation. Experiment consists of a series of measurements and theory – of a system of equations. Mathematical science is exact but has no inherent experiential sense borrowing it from perception by way of measurement.
59. Science starts its work by isolating magnitudes – qualities ordered in time and space by means of numbers as values. The first parameters – bigness and number are imposed by the fact of finite extension and multitude of 'equals'. The equal and the one are idealisations of the similar and the whole. In fact equal things and unchanging wholes do not exist. Magnitudes are qualities designated by numbers, made measurable, juxtaposed to a measuring unit. Mathematics is the first construction in the domain of space and quantity. Next are time and quality.

60. Counting is the operation of determining a number for a set of equal objects. Counting in a fixed order is characteristic for calendar. Once the period of 24 hours fixed dates are unequivocally determinable in calendar. Days are presented here as dates-numbers.
61. Measurement is a typical observational operation: determination of a number (value) of a magnitude (in nature). The magnitude is a theoretical concept. It corresponds to the degree in which the quality is present in the object. Thus the temperature of water is determined by means of a thermometer in Celsius degrees. An artificial measuring rod is put upon nature. And here a residual indefiniteness arises (inexactness of measurement). The form of this measuring artefact is predetermined by the accepted units of measurement which depend on theoretical definitions.
62. Equations do not explain states. They presuppose them as systems of certain values. On the basis of them equations explain elements of future or past states. Through the equations a form of physical reality, of the perceptible world appears. It appears in the form of the equations – of magnitudes (parameters of state) and their relations. From the state given in this way other states of the same system for another point of time are deduced. What unifies the different states in a coherent whole is the equation, the interdependence of states which is simple and constant in the simplest cases. The world doesn't warrant the conservation of form but experience confirms it.
63. Physical laws give expression to the form of the world. They are symmetrical, otherwise they wouldn't be laws. They aren't found in nature, nor are they ideal forms. Laws are artefacts and are inexact in comparison to measurements as are measurements in comparison to perceptions. Enduring perceptions are the core of collective descriptions and theoretical propositions such as laws. Laws are neither universal nor necessary. They are problematic and are subject to test and correction. Laws don't explain states of things in the world but show them. The limits of physical description are also limits of the physical law as equation. These are constellations and biological texts.
64. The form of the physical explanations of dynamics is the solution of equations for states (local mundane forms) where some variables are functions of other variables. From some initial state, subject to certain law another state in another moment is deduced. In all of them an arbitrary kind of order or disorder indifferent to the physical theory is presented by means of conditions – values of parameters. But subject of the technological explanation of a machine is exactly the specific ordering, the structure of the machine given in terms of values of parameters and geometrical forms.

XII. INSIGHT INTO THE ATOM

Here an analysis of the world is given as brought into appearance by quantum mechanics or 'quantum phenomenology', along with the discussion of 'physical meaning'. The existence of a micro-world is denied and instead only that of boundary quantum phenomena is affirmed. We are not penetrating beyond the visible but find ourselves on its boundary, on the boundary of the world. Here things 'dissolve' to a certain degree into uncertainty not only with respect to impulse and co-ordinates but with respect to existence. The quantum world is similar to Buddhist abhidharma: cores composed of an immense multitude of units flashing between existence and non-existence. Moreover this world is inconceivable without the observer's perception.
Quantum phenomena are a great and for some part of scientists still

unassimilated lesson on the phenomenal nature, boundary position and lack of foundation of world and science. They confirm the motor conception of the perceptual nature of science's sense, its boundary character and phenomenality.
65. Wilson's camera filled with water steam shines on when electrons are passing through it. This observation is as though seeing of electrons. Bohr, Heisenberg and Schrödinger are in trouble to determine what actually is being seen. Heisenberg comes to the result that it is up to theory to answer the question and gets the uncertainty relations. Thus quantum mechanics makes the decisive step towards the boundaries of observations and replaces data with description.
66. To grasp the nature of physical meaning is of decisive importance for philosophy of physics and of empirical science. The determination of meaning gravitates towards observational operations with statements of perceptions. This can be explained with the perceptual form of the world as a living corporeal process.
67. Einstein. Can quantum-mechanical description of physical reality be considered complete? "In a complete theory there is an element corresponding to each element of reality. A sufficient condition for the reality of a physical quantity is the possibility of predicting it with certainty without disturbing the system. In quantum mechanics in the case of two physical quantities described by non-commuting operators the knowledge of one precludes the knowledge of the other. Then either (1) the description of reality given by the wave function in quantum mechanics is not complete or (2) these two quantities cannot have simultaneous reality. Consideration of the problem of making predictions concerning a system on the basis of measurements made on another system that had previously interacted with it leads to the result that if (1) is false then (2) is also false. One is thus led to conclude that the description of reality as given by a wave function is not complete."
68. Bohr. "It is shown that the 'criterion of physical reality' formulated by Einstein, Podolsky and Rosen contains an essential ambiguity when it is applied to quantum phenomena. In this connection the viewpoint of 'complementarity' is explained from which quantum mechanical description of physical phenomena would seem to fulfil all rational demands of completeness."
69. From the co-ordinate system of this study we may say that in both cases the observer takes part in the shaping of reality. This is because real space-time is such as is measured by the observer in the zero point of the co-ordinate system. Here, as in relativity theory, observer and apparatus go together in producing a value. There is no time without time-measuring by a clock made and seen by human similarly as there is no quantum state without measuring by observer by apparatus.
70. The boundary of description by numbers is not visible from without. It emerges in the process of description or expansion of objects which can be characterised as texts. Those are series of signs ordering by means of a code units of life and producing the order of structures and reactions in the cell, the organs and systems of the organism. They define the order and form of re-synthesis of disintegrating proteins as well as the order and form of replications. They are directing the way and spatial orientation of embryogenesis.

XIII. LOGOS IN EMPIRICAL SCIENCE

71. Induction as a transition from the particular to the general is empty, no less than deduction, because of the vacuity of the universal, the general, the particular and the singular. There is no conclusion from the particular to the general and the universal. Induction as the process of inducing statements by other statements after a preceding identification isn't logical in character and is involved also in deduction. It

is accomplished on account of epistemic potentials in a field. It induces the transfer of a formerly described form on similar objects. Inducing is limited. As long as this process is possible, i.e. until it leads to uncertainty and ambiguity unacceptable in the given conditions, induction has a sense. It is the way new objects are described.

72. In the world as present neither the universal, nor the general qua general, nor the necessary is experienced. Therefore deduction which is a necessary transition from the universal and general to the particular and singular is only a verbal derivation preserving the meaning of accepted definitenesses. Deduction in science is important with regard to the ordering of propositions according to their meanings, exhaustive derivation of consequences and their testing. But it provides no knowledge about the world.

73. Logic is a form of interdependence according to meaning and of derivation of statements from statements on account of the preservation of meaning. Logic in empirical science is 'flexible'. Important contradictions are rendered harmless by means of re-definition. This happens because of contradictions being a verbal phenomenon. The ordering of characteristics according to definitions is erroneously hypostatised as a logical form fundamental to the world (Russell, Wittgenstein). Logical structure is produced by the interlacing and partial identification of different definitions. Thus a web of correlations of identical definitions is spinned. Logical form is not mundane but verbal.

74. The logos is an integral attitude and cultural archetype of the West. It lies at the root of Western civilisation's world description. Logos is to say order in world and language. In the logos language and world have one and the same form. There is no unknowable and inexpressible in the logos. Logos is number and word. But to consider the logos as expressing the world and having one and the same form with it is to confound life with an artefact. The attitude of logos is at a loss of fainted and creates infinite thought fictions – modes of the infinite. Empirical science is finite and therefore vital.

75. Eastern mentality takes language to be a means for expression and communication of descriptions of things and events in space and time. Language is not fit to give expression to the Mystical, to pure mind, to Buddha-nature, to dharmakaiya, Sat-Chit-Ananda, Dao, Samadhi, Zen. The world speaks no language and the wise comes to the light after having overcome the conditionedness inherent in the flow of thought and language.

XIV. THE HUMAN FORM OF THE UNIVERSE

We, human beings are sometimes wondering that the world is such a suitable habitat for us. Religious people and, to a certain extent, people in general believe that the order in the world is created. But one is really astonished when in the zone of scientific experience where this fate is not admitted suddenly a range of signs is discovered that the world is such as to allow us to live in it. Here I am attempting to show that the explanation of this profound paradox of empirical science lies in understanding the world as life and of the form of the world as living form, the form of man as a knowing being.

76. The so called anthropic principle, the contention that we live in an extraordinary point of the evolution of the universe or in an extraordinary universe puts limits to the numerous a priori possibilities of an universe inhabited and known by human beings and aims at the explanation of its uniqueness (its beginning, the constants and their relations, history). The weak anthropic principle runs as follows:

The presence of the observing human is limiting the possible universes, constants, initial conditions and histories. According to the strong anthropic principle the universe is only the one in which people live. It is projected with regard to and develops only towards life and reason. All other versions are senseless.
77. Entropy and the anthropic principle are linked together. Entropy is indefiniteness and the universe is determined as fit to be inhabited by humans among an indefinite variety of possible universes. The universe is supposed to have started its history from a state of high definiteness and to degrade steadily to complete chaos. This is the 'thermodynamic arrow of time' which coincides with the 'psychological' one (Hocking). Both on their turn are derived from the 'cosmological arrow', according to Hocking's analysis, the direction of expansion of the universe. This type of analysis is grounded on empirically unverifiable assumptions. The determination of time's direction has to be turned the other way round. Its direction is an effect of life process. Chaos and order themselves can be determined with respect to life only. The 'cosmological arrow' has no direct bearing on time.
78. Explanations in terms of the anthropic principle are odd. They make use of man's existence which according to the scientific attitude is itself in need of explanation. A second oddity is that an enormous multitude of possible universes, constants, initial conditions and histories of the universe is postulated. This multitude is nothing more than a theoretical construct. Probabilities are measured by frequencies. There are no data to determine the frequencies of different universes, initial conditions, constants and histories. We have one single universe, set of constants, initial conditions and one history.
79. The paradoxes of the 'anthropic principle' can be formulated in the following way: 1. Man's existence is not a principle since it results from a history which could be otherwise. 2. The untestability of the possibilities of universes deprives them of physical meaning. 3. The existence of the universe without an observer has no sense for its appearance is an effect (also) of observation in which it appears. 4. Singularity is a contradiction: in it not only the universe arises but also constants and laws.
80. In this study the anthropic problem is solved in a broader perspective. In remaining a philosophical one and however without the claim to give methodological advice it aims nevertheless at the correction of scientific attitude in contemporary empirical science. In existing in the world man does not limit it. Man shapes it as an universe known to us. Improbabilities in science are given rise by indefiniteness. Time in physics has a sense only for a living being measuring it and perceiving local simultaneities (Einstein). Beyond that it is only an artefactual projection forwards and backwards. The change of attitude is going to transform by and by the optics of empirical science and the form of its results, as well as its conjectures.
81. The unlocality in the Astro-physics is surprised by the human form found in the Universe. Locality imposed into physics by Einstein may be explained as each perceptual situation's being centred in human body. Probability is a mathematical measure of the frequency of observation. The anthropic question is not a problem of the world but of today's science. Science has either to endure in its oblivion of man (the observer) or to become aware of him properly, as what is giving rise to the form of experience, observation, nature.

XV. VISIBLE AND INVISIBLE

The world is such as it is seen because seeing shapes it. Seeing can be strengthened. The world is exhibited more and more distinctly in the expansion of

science. The eye is supported by the mind and the tools created by mind. The outlines of heretofore unseen things are emerging. The definiteness of the world is augmented. But there are no things with a visible form beyond the visible. There is no way for anything to lie hidden behind the visible since all space is visible. It is shaped by vision.

At the end of the 20th century invisible things keep their attractiveness for scientific attitude too. Science is full of invisibles. But they are gradually supplanted by visibles. The insensible remains forever beyond this sphere: our mind, things without space and time, the mind and the condition after death. To consider anything as realisable is to forget mortality.

82. What is observable and what not is of paramount importance for empirical science. Rather frequently observation in science is confounded with indirect inference from data. The observable is considered to be discoverable not only in observation but in an indirect way.

The assumption of the 'indirectly observable' or of visions of invisible things as elementary particles/waves with a probabilistic existence, of DNA's double helix, of the Big Bang and of the universe is a special case. Everyday we are imagining unobservable things. But if we are inevitably to retreat into the invisible in order to describe the visible what then distinguishes magic powers from quantum objects? How are we to determine which vision of the invisible is true and which is not? If the invisible ether doesn't exist what about the invisible electromagnetic field? One is drawn into an interpretation which is infinite and indefinite.

83. It is an old custom of physics to eliminate questions which cannot be answered and concepts which are not liable to empirical test. This is how Einstein proceeds with absolute time and simultaneity on his way to the Special theory of relativity. This is how Bohr proceeds with micro-objects when reducing them to quantum phenomena. But how does it come that micro-objects or the universe exist? Are they in the world or are they merely visions? Are there other worlds which science is touching? How does it stand with the 'independent objective world'?

84. Scientifically indescribable is all that is unobservable plus what is observable but indescribable. Hence indescribable is the mental, the past and the future, as well as what escapes from counting, measurement and experimental identification. The last category of the indescribable is unclear. What seems beyond observation today can some day possibly be observed by means of a new technique. There is also a third category of the indescribable. This is the observed for the description of which as a fact appropriate conceptual apparatus is lacking.

85. Explicable in principle are the observable and describable things and processes. Momentarily inexplicable are those phenomena which lack a description or for which it is unclear whether a technique for description and observation exists – a theory, a model and a measuring (reading) technique. Explanation has its own limit and that is theoretical form. Explanation does not explain the facts at hand, the systems, the structures. First, explanatory laws are not explicable although they may be reduced to other laws. They are always prerequisites without which explanation is impossible. Second, facts or measured values are not explained. From several facts or values an explanation of one fact or value is drawn. The present, future or past value of a parameter is explained by means of a law and measured values of other parameters involved in the law. Things stand analogously with models outside physics, with qualitative explanations. Thus explanation in empirical science doesn't explain the form of the world but makes use of it for its synthesis.

86. Each time when a theory seems to give an exhaustive explanation of the

world the question about the end is raised. Thus physics before Max Planck seemed to be completed. But then a fundamental change came and the mechanics of quanta was born. Quantum mechanics itself was established as a final explanation against Einstein's suspicions of incompleteness. At the end of the 20th century with the attempts for integration of fundamental theories once again is raised the theme of the end of physics as the integration of the four fundamental interactions – gravitational, electromagnetic, strong and weak one. We have partial integrative theories. 'The great integration', the reduction to one is the natural aim of today's science. But after the one follows zero.

XVI. SCIENTISTIC UTOPIAS

Artificial life, intellect and man, as well as perfect society are utopias similar to the utopias of a perpetuum mobile of the first or second kind. They are rooted in the blindness of scientific attitude for the boundary character of life, man and world, for the boundary character of science and technology.

87. The form of the world is the form of life, a form which is living the world. And world is world insofar as lived. Making is but a moment of life. Life cannot become an artefact.

88. Artificial intellect is a label used without comprehension. The idea of artificial intelligence is an inertia of the scientific attitude lacking awareness of form and limit. No science can ascertain the intellect, artificial or not. People can ascertain their own or other people's intelligence not by discursive derivations but in the flow of their lives shared by their fellow men.

89. Society is a living form, collective unity of living human beings. A (perfect) society cannot be made. It would be like a perpetuum mobile. For this amounts to a change of the form of human world, the form of world.

90. World with its form cannot be made. Making, similarly as knowing, cannot transcend the world with its form and trans-form it. What the form of the world consists of cannot be made. Such are perpetuum mobile, living cells and bodies, societies and intellect (artificial intellect).

CONCLUSION

The conception of the world as life around which this study is composed has as yet not been so systematically applied to the topics of empirical science. This application has been its first test.

Contemporary science is not essentially different in its attitude from classical science. The world is regarded as self-sufficient out of man and independent of him. In quantum mechanics under observer the apparatus measuring quantum processes is understood. But this apparatus is intended as a continuation of the human body. In this apparatus, as well as in microscopes and telescopes human beings endowed with a body find those perceptions without which it is impossible to make judgements either about micro-, or about mega-, or macro-world.

However science, although forcibly, not spontaneously and least of all with a mature awareness, is moving towards a more mature understanding of 'objectivity' as a form of science most powerfully following human form and eliminating unique individual deviations from a description acceptable to a maximal number of people. And what is the most powerful which people share with consensus is the direct perception freed in a maximal degree from cultural particularity and accessible to humanity.