

Seminar at Accademia Belle Arti “Pietro Vannucci” of Perugia
Nuvolo sull'equazione tra Kaos e Armonia. La pittura serotipica tra telaio e computer,
speakers: E. Abbozzo, B. Corà, F. Federici, G. Arcidiacono, M. Barboni, A. Iori,
Passarella, Nuvolo, G. Galletti, R. Saldarelli, G. Mollo, W. Lok, Karpüseeler,
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Edgardo Abbozzo (Academy Director): A thought of welcome and thanks on behalf of all components, primarily to Professor Nuvolo who has accepted this invitation of ours to introduce us to an important and living part of his work. Professor Nuvolo's critical profile certainly, better than I, will be done by Professor Corà, I thank him sincerely anyway. I also thank on behalf of the chairman who was late due to a mishap, to all the speakers particularly to the panelists and Professor Franco Federici [professor of Neurology - University of Perugia, ed, ed.], Enrico Crispolti [professor of Contemporary Art History - University of Siena, ed.], Professor Gaetano Mollo [professor of Pedagogy - University of Perugia, ed.], Professor Riccardo Saldarelli [professor of Painting Techniques - Academy BB. AA. of Florence, ed.], and Professor Bruno Corà [professor of History of Art - Accademia BB. AA. of Perugia, ed.] who is to coordinate this work. As a procedure, while waiting to open the debate we will see a recent film by Maestro Nuvolo.

[Video of an interview done with Nuvolo by Bruno Corà. Unarchived, ed.]

Bruno Corà: By now, let us say, it is indicated this observation, unfortunately, did not also involve the modification of the phenomena themselves, so we were never again able to arrive at a kind of accomplished objectivity. I had prepared a talk which, of course as is always the case when working, was abstract; that is, it had a value in itself for what was the reading I could do today, together with Nuvolo of Nuvolo's work; but this talk which in part went over the cycles of his activity, and therefore was strained in the demonstration of this 'chaos-harmony equation' would now show all its limitation, even its incompleteness; given the fact that a large part of some of the aspects I wanted to touch upon were also indicated by this video, so I don't want to bore you further.

The video allowed us to observe these aspects of Nuvolo's work and also to indicate, to those who had not had them present to direct observation that could be accomplished during the exhibition that was held in February here in Perugia and in Città di Castello; this video allowed us to get to know these cycles and to see how Nuvolo's research was accomplished gradually over time through stimulations, which almost always - in fact I would say always - drew inspiration and origin from the use of a particular technique, the technique is the one that gives the name, indeed the subtitle, to this seminar is the silkscreen technique. And so, this seminar we wanted to call it *La pittura serotipica tra telaio e computer*, and it wants to take stock of this particular versatility and technique that Nuvolo has always shown, and on the technique I will say right away that we should raise questions, ask ourselves questions given the aesthetic-contemporary thinking about it that has formulated new thoughts. And so this, coming to an Academy of the Arts, where we are today, should be one of the bases of fruition and comparison; what is the problem of technique in the execution of the work, and we will see how, probably from the

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contribution of the intervention of the colleagues, and from that same an authoritative man of experience and artist like Nuvolo, we will see that this aspect of technique reserves many questions, many questions about the very problem of artistic experience and the sublimation of the mind or knowledge, and therefore the attainment of the so-called products of the production of art, and therefore the very question of what is this art, and how much of the technique is the author of this art, or whether the relative art defines it. During this famous video, which we have observed now despite some technical deficiencies due to our unprofessionalism, however we had very relative means and I must say that it is the result of a remarkable effort of the young student attending the Academy, Livi, for itself it was a kind of experimentation, we did what we could. During this observation I felt a couple of points that led me then to change the itinerary of this report of mine, and to question more vividly the question that is on the table, that is, the chaos-harmony relationship.

The points are these, at a certain moment right at the very end of this conversation, interview, with Nuvolo, I was asking, "How can the apparent paradox that bears this chaos-harmony relationship be recomposed, given that these two terms seem to distinguish a binomy?" and Nuvolo answered this question, "But chaos is harmony."; and for a neophyte scientist that I am, - you also saw, I accused the joke - I didn't have many arguments in my bow to shoot an arrow again and take the discussion further. But this peremptory statement "chaos is harmony" I have to say that, I was strongly impressed, thunderstruck and still to this day-despite some clarifications that Nuvolo himself in an even closer conversation was able to provide me with; despite some readings that I then did on this topic-it is always on the surface very difficult to accept this statement, and yet it seems to have a foundation. So then, on this issue I will ask my colleagues - in particular Professor Arcidiacono and my colleague Saldarelli - to intervene, to tell us in what way, in what sense, from their point of view this aspect, this claim is possible to be made.

Then Nuvolo went a little further, and even said, "There is nothing that is not chaos," and here the world began to collapse on me, also because if there is nothing that is not chaos, then even everything that happened by exact science-physics, mathematics-or relatively exact certainly begins to produce questions; but I put these questions on the table, also because, I repeat I am here not only to make a reflection but above all to learn also from those who know much better than me this territory, and it seemed to me that these two elements should belong to our discussion. And then there is a third point that is, instead, broader and broader concerns another statement that, during this conversation, Nuvolo himself says I noticed it and so I ticked it off; Nuvolo states that "Painting comes from itself, with itself and comes to itself," so he comes to a statement that a place of ideality and therefore of making, which concerns the work as an organism, which is a cyclical place; and the question that I ask myself, that I ask him and all of us, then is, "but the artist, then what about this cyclical place; where painting comes from itself, if he sees it with itself and arrives at itself; and therefore he so peremptorily asserts an autonomy that instead we thought had to somehow confront even the external objective world and the world of our feelings and perceptions, of our will? ". So, these are some of the questions that I put on the table, rather than asserting anything myself this morning, also because I have to tell the truth it is quite recent my engagement in reading the work of Nuvolo, and to this I would refer - for all that is the analysis from the lexical point of view that I have made on this work - to the catalog of this exhibition that was done this year and I would, instead, be much more pleased to go into questions and problems, which we all have curiosity to know more about. I

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am announcing, however, that on these points there is another aspect that I had already indicated, which is of great concern to me, and on which I have the necessity here to make some quotations; the aspect that I am interested in touching on today and which I would like then to collimate with the problem of the chaos-harmony relationship, or of this supposed equivalence; this aspect concerns the problem of technique.

The problem of technique, and which I have also had a chance to reflect on, invests a lot of the interests of our invited speakers as well; not only of some of the theorists of perception and therefore of the whole problem concerning the configuration of images within the process of nerve formulation, which belongs for example to the study of Professor Federici; but I think also in a very broad way the interests of Professor Arcidiacono whom you have known as the author of this very important, and still much discussed, text concerning Space, Hyperspaces and Fractals, thus those complex systems of representation, which precisely, after Mandelbrot are now the subject of a great deal of reflection and questioning; and then I was saying about the same colleague Saldarelli who is a professor of painting techniques, as you know in Florence, who in Caprese Michelangelo has very often - through seminars - grappled and measured himself with the problem of technique and the problem of the work of art. But on this problem of technique there is a very high questioning still beyond being exhausted, which concerns the aesthetic reflection of Heidegger, who on these points would serve with brief quotations, I will still provide questions that - I repeat again - are here, placed on the table and are offered precisely because they are the object of a mutual confrontation and stimulation, which today sees as its object the analysis of Nuvolo's work.

To begin, let's say, from the questioning that for example, on this aspect, on the problem of technique, the works that we see here, that Nuvolo brought: there is the first one on the left, is one of the works that we call *Aftermandelbrot* i.e. in an internationalist term, it stands for distinguishing in a literal way a product, a pictorial object, a work that comes after, and following an elaboration of further definition of a possible complex system, after Mandelbrot's formulations; so from this point of view if Mandelbrot constituted - and here my colleagues can also correct me - a very advanced frontier of complex systems and representation, through fractals; here we are faced with a product that, taking into account these results, dares and intends to go a bit further; and it does so with results that are before our eyes for their appreciability, but on which perhaps also technically it will be important to dwell today given the presence of some technicians, such as Saldarelli. On the right, on the other hand, Nuvolo brought an old, in quotes, *Oigroig*, i.e., a work some fifteen years removed from this *Aftermandelbrot*; it is a pictorial result obtained, in quotation marks, as we say 'freehand,' it is not 'freehand' because we are talking about a technique - the silkscreen technique - but precisely it does not make use of a computer, it does not make use of a cybernetic, technical-informative complex element such as the computer; it is something made with the silk-screen frame, a squeegee and with color. The other one, however, is, as you see, the *Aftermandelbrot* is obtained yes with color, it is obtained yes with the screen printing frame; but the formulation of this image, from the ideational point of view and from the point of view of its fine-tuning and its definition, makes use of the computer; therefore of the monitor, of a keyboard, therefore of an obviously complex mathematics, of vibrational numbers, of errors and many other things. Probably, if anyone is interested to know a little bit more, we can question the most direct helper to this work, the closest collaborator that is Paolo Ascani, Nuvolo's son, who is here in the room and therefore, being a participant in the process of defining this image; having been the originator

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he can give us much more notions and information.

But the problem I wanted to pose with regard to technique, which will then have to lead us to the re-examination of the chaos-harmony binomial, is a problem that Saldarelli cannot, for example from his point of view, but conjugate directly to the very object of the work of art, which Saldarelli defines a work of art as “a suffered result of a subtle balance between two elements technique and creative grace”; here on this point already a rich amount of questions can be unleashed: what, for example, does ‘creative grace’ mean in the face of the concept of technique which seems to be, on the other hand, much harder and more definable; ‘creative grace’ seems to be something that blurs, that escapes and therefore difficult to connote. On the other hand, ‘creative grace’ is closely connected to the, I would say, nervous and neurological processes of the imaginary and therefore it is connected to ideation, it is connected to that which is mental as Saldarelli then indicates in some of his reflections; and all this then needs again - in a cycle - a technique that suggests to one’s sensibility, to the artist’s sensibility, the possibility of translation of this ideation, this nervous formulation, this imaginary. Of course, we then leave the field to our colleague Federici, to entertain about these image data and how they build the network of information data, how they build-through the memory warehouse, as Saldarelli indicates-the images themselves and how they then become objects of communication these images. However, actually at some point in time, at the moment, as Saldarelli himself indicates, “there are information systems that propose themselves as interactive technical-design tools,” Saldarelli writes, for example, in one of his talks on the problem of the use of computers in art; and what does it mean-let us ask ourselves what it means-that some information systems, such as those for example related to computers, pose as interactive technical-design tools, that is, as something that is not neutral or as something that pushes, interferes, suggests in creative terms to the operator solutions. Thus they are no longer merely means, mediums, and no longer serve merely the execution of some thing, but these technical-design tools, of which the computer is certainly an exponent, are interactive; their exploration of figurative worlds, introduces the operator into an area that before was purely in the domain only of the imaginary; but now it seems that this imaginary also belongs to a machine, which of course we ourselves have previously informed, and this machine is able to process on its own visual phenomena that seem to elude us. And here there is also another big question mark that belongs to Heidegger’s questioning, from the aesthetic point of view, that is, can technique take us to a boundary, to such an extreme latitude that it means a loss of orientation for us? can technique have already reached this boundary, given the fact that there is such a big gap, such a big gap between certain levels of life and certain anthropological conditions and then the exercise, instead, of this technical domain by a very few ‘technographers’? Here, these are questions that we may never be able to answer completely, but which we want to ask ourselves today with respect to the use of this machine, of the computer, the use of this medium that Nuvolo himself used but also underestimated, wanting to make it clear that it is nothing more than a tool, but if Saldarelli says it is interactive then it may be not only a neutral tool, but some thing that escapes our domain.

I will conclude, at least for the first round, by saying this: as far as I am concerned, my interest in technique comes from the fact that ever since antiquity, ever since the ancient quadrilateral system of Aristotelian randomness, ever since the time when questions between cause and effect were posed, ever since then techne-which was the only thing that existed, there was no art as such-was directed toward producing something, but producing something means bringing

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about unveiling, bringing something into the world, bringing something into being. Unveiling, in my opinion, has to do with exactness, and techne also has to do with exactness, but exactness does not always have to do with the true; personally at this moment I am interested in 'true' because it is the last instance of the problem of knowledge, and I would like to grasp at least how much 'true' there is in this hypothesis of the chaos-harmony equation that we have put at the basis of this conference.

I probably still have a few tricks up my sleeve but I'll save them for later interventions. Now I would like to turn the floor over to Professor Franco Federici, who besides being a professor of Neurology at the University of Perugia, as of this year is also our colleague here at the Academy, and somehow it feels like we are working in a very familiar but also a very exercised laboratory; since this year his teaching of Theory of Perception intends to deal precisely with a number of problems and aspects that are present in Nuvolo's work; whom I would like to take this opportunity to greet because I see him returning to the Academy after an absence of a year and a half and so we are happy to see him back here.

Franco Federici: LPerceptual phenomenology is processed by the reel **in the fronts** that are the substrate or final place of expression of transport between the molar structures of psychology and the molecular ones of biology; thus, the different ways of representing matter are to be considered as hypotheses of the perceptual system. A possible exemplification of this interpretive probability is represented by the figures which generally have a spatial bivalence, the perceptual system alternately considers the different hypotheses avoiding confusion; you all remember the structure of a cube in which there is an 'O', which is once placed on the front face and once on the back face, and this ambivalence has only partial temporary resolutions, it does not assume a scientific trend. Perception, in fact, is the most likely outcome of the interaction between sensory stimuli and acquired notions, both of which are acquired for every other circumstance of the thing we are examining; after all, we are equilibrists, dangling between the transformation of the physical qualities of light and sensation, giving meaning to brightness and darkness. It is the brain that represents these qualities of the world, when the evolution of matter prepared the rudiments of the systems of perception in living beings the world had brightness and color; it is classical but unequivocally correct to say that before life appeared on earth all was silence and boulders -- poets say -- crashed down from the mountains without a roar. So, the central nervous system is the structure of perception and accumulation of experience, but we may be confronted with a new thing that resembles nothing we have ever seen before, none of the perceptual categories experienced, so what? We have to find an adaptation in a satisfactory way. We all, for example, have in our perceptual memory enough frames, that is, in an enclosed room and visiting an apartment one of them will attach to the place we enter: this one connotes a kitchen, that one connotes a study, and so on. In the phenomenology of recognizing the frames best known to us, a decisive role plays the representation of directions; if we walk inside a tube with a circular cross-section we could not help but think in terms of low, high and walls, albeit with very vague boundaries; if we had no way of representing the scene in terms of known and usual parameters we would have no proven thinking skills to apply to it. The hypothesis of the march within the circular-section tube and the conjunction of scene and direction is useful, because it suggests that we represent directions and places by linking them-when structural-to a particular set of pre-nomic neural processing that is usually referred

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to as 'directions. The perception scholars at NIT' who are taking an interest in this aspect exercise the critical doubt of scientists, but they are quite firm in this statement, in this hypothesis, interpretation; the way we perceive and structure the world. Their use, of directions, allows us by quieting us, to solve perceptual problems of complexes - illusions, perceptual distortions, for example - by the method of reformulation; for our brains, when they fail to discover what different representations have in common, modify the way of seeing them; an example of perceptual reformulation is impossible to intercept, from the pure and simple point of view of perception and phenomena that we manage to intercept within perceptual phenomenology; attempts are really doomed-for the moment-to great failure; we only know that in one of the three afferent pathways that carry one of the three messages, the chromatic one, up to the visual occipital cortex, it is possible to highlight a transit of the chromatic section, through a dejection that shows it being called a block, not by chance someone then played with this term to make something that can also be funny.

An example of perceptual reformulation is, therefore, impossible because we do not intercept; we humans are prevalent verbal communicators, so Marvin's group cited above uses an example of reformulation to give us a linguistic-based idea; how many reformulation hypotheses can be made for an arc? Here are some ways that please think in the visual perceptual analog equivalents, the reformulations for the arch:

- aesthetic "a pleasant harmonious shape."
- dynamic "the top falls off if either support is removed,
- topological "the arch surrounds a hole in space."
- geometric "it forms an inverted 'U'",
- architectural "the top of the arch could form the base of something else."
- constructive "it needs a key to hold it up."
- circumferential "can be used as a detour to get around an obstacle."
- vehicular "can be used as a bridge to get from one place to another."

The visual perceptual system does not behave, in its assumptions the interpretation, differently; because these are the brain's modes of operation. But when the structural arrangement of the reality to be represented is devoid of form, understood as perceptual habit, when the optionals cannot be easily used, as well as the perceptual reformulations of which I have given verbal analogical model; when we find ourselves in a situation like this, when these models are inapplicable; for the reading vision of fractals - of which Arcidiacono will tell us to make his own - these rules, hypotheses, phenomenologies of perception are out, they are out of the cognitive scale; they are a philosophical and scientific tool that we reduce to Gnostic terms because we are faced with the attempt to depict higher psychic activities in terms that should formally represent a biological and chemical metaphor of matter organizing itself. [***] It is the biggest problem for scholars of perception, precisely because perception is done by hypotheses that are not experimentally defectible, the happier, the more fortunate is the artist who can use representational models that are articulated on a thread of parallel networks using 'case-paradox,' 'chaos-creation,' with the degrees of freedom that are peculiar to him.

Nuvolo's works, the subtle link that unites them, represent in the neurobiologist's reading a non-gapless way of representing the fundamental directing forces of biology at the three levels macroscopic, cellular, and molecular. Some aspects recall a morphological iter from molecular biology to the structure of the living, but there are formal anticipations that express the ways

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of the appearance of the structure of life on earth in sub-molecular terms; I am referring to the abiological synthesis of the precursors of biogenesis. Nuvolo depicts with the artist's soul aspects reminiscent of the process of the beginning of chaos, from chaos toward the structural organization of life; a vision that on the scientific level finds legitimacy in the conditions at the limits that derive from our current knowledge of living organisms. Nuvolo tests this hypothesis in the articulation of formal elements reminiscent of the path of the precursors of protorganisms to the organized forms of life, it seems to me, makes us relive processes unraveling from the appearance of the first molecular aggregates in the seabed and born on the continents, to the appearance of man; a path that stopping at the first populations endowed with an encephalon, who signified the world, because they perceived it, and arriving up to us men of the end of the second millennium, proposes a space of time of 3.5 billion years.

B. Corà: Thank you; I give the floor to Professor Giuseppe Arcidiacono.

Giuseppe Arcidiacono: This short talk of mine has the title *Fractals, chaos-complexity* and will illustrate concepts that are set out in my recently released book entitled *Spazio, Iperspazi e Frattali* [*Il magico mondo della geometria*, ed.] As everyone knows, in geometry the point has no dimensions, the line has its own dimension, the plane has two, the space in which we live has three dimensions. Geometry then, recently, has been developed in two somewhat opposite directions; on the one hand, spaces with four to five dimensions those famous 'hyperspaces' have been introduced, which have been used in physics; and even more recently geometry has introduced 'fractals' and that is spaces with a non-integer number of dimensions. Fractals, then, are strangely connected to the problem of chaos and complexity, so in this talk I will deal precisely with the problem of pathological curves that then result in fractals, and then with the connection between fractals and complexity. As everyone knows, in geometry "a shape is said to be continuous when we can trace it with a pen without ever detaching it from the paper, otherwise the curve will have discontinuities, that is, singular points at which the curve can make finite or infinite jumps," but a real innovation to geometry came with the research of Cantor and Peano, who constructed a whole series of pathological curves that undermined the very foundations of Euclid's geometry, namely the concept of dimension. On July 20, 1877, Cantor wrote to Dedekind, "I seem to have proved that a square does not contain more points than each of its sides, I see it but do not believe it"; also in 1890 Peano constructed his famous curve that fills a two-dimensional square; whereas a curve should have only one dimension, so he constructed a curve that instead of one dimension has two. A heated debate then ensued about the concept of dimension that would lead to Mandelbrot's fractal spaces having non-integer dimensions, thus leading to the disconcerting conclusion that commuting curves with ellipse circumferences are pure geometric abstractions, while the curves deemed pathological are those actually observed in nature; for example, the line of a coastline drawn on a map appears to us to be more and more jagged as we move on to more detailed maps, and it is no longer possible to uniquely define the length of the coastline, which tends to become infinite as we get closer to it, that is, as we get closer, the coastline becomes more and more jagged and thus its length becomes infinite. The dimension of space can be defined by a simple formula, and this allows us to generalize the concept of space by introducing fractal spaces whose dimension is not an integer. For this purpose we observe that if we divide a segment of dimension 1 into 'n' parts it will result in

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being divided into 'n' segments; similarly if we divide the side of a square of dimension 2 into 'n' parts it will be divided into 'n'² squares, and if we divide an edge of a cube of dimension 3 into 'n' parts it will be divided into 'n'³ cubes; the example of the dimension 'D' can be defined by the formula: **D = log A + log D**

where A is the number of segments, squares or cubes obtained and gives the number of parts into which the segment is divided; applying this formula we find the dimensions: 1) of the segment, 2) of the square, and 3) of the cube. This size determination can be applied to the case of pathological curves and gives us non-integer dimensions.

Let's take simple examples that I have given you in the drawing; if I take a segment whose size is 1, I divide it into 3 equal parts then I take off the middle part - and then this here is the first step - then I get 2 segments detached from each other, then if each of the segments I make, I divide it again into 3 parts and take off the middle part, then I get 4 pieces detached from each other, this operation I will repeat endlessly; then it is clear that the curve you get at the end - that is, the segment - is the famous Cantor set, which if you try to imagine it, it is easy to imagine it, it is clear that I can understand the individual steps, that is, the first step I understand it perfectly, the second step I understand it perfectly, however, if I keep taking off the segments at the end it seems that I have taken everything off and I have gotten nothing; in fact, if instead I, do the calculation with the above formula you can see that you get a space whose dimension is **log 2 + log 3**, i.e. log 2 are the two parts that I have retained, log 3 would be the three initial parts from which they started, basically I start with 3 parts, take out the middle part and I have 2, I continue to infinity; the dimension is **log 2 + log 3** done the calculation you get **0.6309** and then I come to the conclusion that Cantor's set has a non-Euclidean dimension and is nothing but a point that has a fractal line of dimension <1. The second example, in a way it is of the opposite type, in this case I do an augmentation i.e. I get a line whose dimension is >1 and <2, so the procedure consists of this: I take the segment which is a line of dimension 1, I remove the intermediate part and at the sum I introduce two segments, then this work I will do on the individual parts, and then there is the third step-that is I remove the segment on the first, on the second, on the third and on the fourth-and this I continue to infinity; then it is clear that at this stage we have obtained a fractal. It is clear then that a fractal is the curve that you get after infinite parts and therefore it is of extreme complexity, it is difficult to imagine it, if I try to imagine that curve where I got infinite parts at a certain point I can't do it anymore, I can just imagine divided into three, five, ten stages of the process then the computer can't get the degree of definition to trace make clear the successive curves, and therefore at a certain moment I have to stop. Then you can see that in this case, applying the formula I have to keep in mind that I divided the segment into 3 parts then I put 1 more into it, so basically it was 3 and it became 4 parts and then applying the formula the size is **log 4 + log 3** from the calculation you get **1.2698**. These are very simple examples to show that I have the point that has no dimension, then I have the line that has a dimension, then I would go to the square; in fact there are intermediate curves where the dimensions can increase, for example I that work could be done by inserting two segments, inserting more and then they come to increase the number of segmentations of the space that becomes fractal.

What I'm interested in keeping in mind is that, the fractal in a sense is unimaginable, kind of like hyperspaces are unimaginable; that is, when I have the plane with two dimensions, then I have the three-dimensional space and then the four-dimensional space you're sure that the four-di-

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mensional space is unimaginable, these are the famous polytopes and hyperspheres; these polytopes-for example the hypercube-are imaginable in sensible form; we can say that the hypercube is made up of eight cubes that close, actually in space it is not possible because if I take a cube and the cube has to be surrounded by cubes I will get the cubic meters; kind of like in the planes if I have a square always surrounded by squares I have a polyhedron of squares; only in space I need six squares to build a cube. Then when I go to hyperspaces and when I go to fractals, I go to identities that no one can imagine, I can only imagine either the projections in space and shadows in hyperspace dream space or the properties of fractal construction, after which our minds falter and can no longer understand anything; in fact, pathological curves when they were first introduced made many impressions on mathematicians because they challenged the very basis of Euclidean geometries in which everything was simple and straightforward.

We can say that fractals are a language of geometries, because their fundamental components cannot be observed directly, they are essentially different from the simple figures of Euclidean plane geometry-such as polygons and circumferences-fractals start from and are expressed by means of more varied forms, but with other algorithms-that is, the set of geometric and algebraic procedures that are then translated into geometric form by means of the computer; in fact, I simply define the method of construction. Algebraic curves can be linear, such as a straight line, describable by first-degree equation, or nonlinear described by higher-degree equation-for example, conics and cubics; similarly, fractals can be linear and nonlinear. In linear fractals the algorithms are said to be enlarging, shrinking or moving the initial figures which we call *self-similar*, with many more geometric forms are nonlinear fractals among which quadratic fractals are of particular importance, they have been studied since 1918 by the French mathematician Julia and then recently taken up by Mandelbrot.

If we fix a point in the plane and then establish a quadratic line to move that point in the plane, successively applying augmentation and the resulting succession of points may involve the movement of them; it may vary without limitation by moving away toward infinity or it may remain confined within a certain region of the plane; the free points form the vanishing set, while the other points form the confined set; if the initial point belongs to the confined set it generates a succession that remains closed within a fractal frontier, if, on the other hand, the initial point is outside the confined set the succession that is obtained tends to infinity. It is sometimes found that the confined set and the escaping set are separated by a frontier which is called the 'Julia set'; here then arises one of the most fascinating problems of fractal geometry: the infinite variety of Julia sets admit a successor compiling principle the answer of the fractal image are of two kinds, namely, the Julia set can be a single connected set or it will be formed by infinite disconnected points like dust. If we make the quadratic line vary the control parameter, which corresponds to a point in the plane, then the Julia set we obtain can be connected or unconnected, in the first case we make a point and while in the second case we leave the space empty; in this way we obtain the famous 'Mandelbrot set,' that is, a fractal endowed with extraordinary complexity. According to Mandelbrot in the study of curves we observe a hierarchy of chosen complexity:

- at the first level we find the 'regular curves', such as line and circumference, and the 'elementary classical curves';
- at the second level we can place the 'classical fractal curves' in which the complication does not change when we approach them, they can become more or less complicated but there is

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an invariance of shape with respect to distance, we then have a dimension that remains the same when we approach the curve;

- at the third level we find the 'Mandelbrot set', when we look closer and closer we recognize in some details what we observe globally; however, if we get closer there is a constant increase in complexity; we then have a curve whose complexity increases without limit when we look in more detail. We can say that chaos increases but it has an ordered structure because it can be described mathematically.

- At the fourth level, finally, everything is really chaotic, as we get closer we no longer glimpse in detail what we used to see globally, the closer we get the more we see different and unexpected things.

We can, therefore, say that the simplest level was the only one studied by elementary geometry; the second level is of great importance in applications because it is easily found in nature; the third level is that of the Mandelbrot set; and the fourth level corresponds to the most complete and uncontrollable chaos. In this classification we move from what is simple and regular to what is extremely chaotic, and the role of the underlying categories in the history of scientific thought appears, namely, the relationship between the local and the global and that between order and chaos. These forms of order within chaos can be formalized with the methods of fractal geometry.

Let us conclude these remarks with the relationship between chaotic systems and fractals. In the mechanistic conception, the Universe was regarded as a marvelous machine, consisting of independent parts, in which the whole is the sum of the individual parts. Within this scheme, cosmic evolution is uniquely determined by mechanical laws, once the initial conditions are known. Modern science has outgrown mechanicism and determinism for several, very different reasons:

1. with Einstein's 'relativity' of 1905, it is shown that electromagnetism cannot be reduced to mechanics, and a profound connection between space and time then appears;

2. with "quantum physics" of 1927, Heisenberg's 'uncertainty principle' is introduced, and the double corpuscular and wave aspect of microcosm phenomena. Physical laws then become statistical and probabilistic in nature.

3. with Fantappiè's 'unitary theory of the physical and biological world' of 1942, 'syntropic' phenomena are introduced alongside entropic phenomena; there is then a dependence of phenomena on the past - i.e. causes - and on the future - i.e. ends - it follows that in the universe we have the dual tendency toward order and disorder.

4. Finally, with "deterministic chaos," discovered by Lorenz in 1963, it was shown that deterministic systems-even very simple ones-can have 'chaotic' behavior, and then any prediction of its behavior is impossible. In the study of systems, it is appropriate to consider the most basic one, namely, the simple pendulum-which is a ball suspended from a wire-whose motion is described by two variables, namely, position and velocity; the motion of this pendulum can be visualized by introducing the phase plane, i.e., a plane in which on the x-axis we denote position and on the y-axis velocity, and then the state of the pendulum is represented at a point. Then the various cases are presented:

- if the pendulum is with friction, however we set it in motion after a certain number of oscillations it returns to equilibrium and must stand still, and so this point at which it stands still is called the 'point attractor,' then whatever system I use to set it in motion eventually tends to the attractor which is a point;

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- if, on the other hand, we consider a pendulum without friction, however we set it in motion it will always oscillate in the same way to infinity, and then in this case the attractor is represented by a circumference.

- if, on the other hand, we consider a system consisting of two pendulums, in this case the degrees of freedom are three, then the phase space has three dimensions and the attractor is a 'torus,' to put it more simply a ring; the system of the two pendulums however we set it in motion will eventually tend to a periodic torus represented by a ring.

Until recently, the only possible attractors were: the point, the limit cycle and the one-dimensional torus; for this attractor, the close orbits remain close, the small initial errors remain small, and thus the behavior of the system is perfectly predictable.

But in 1963 Lorenz, studying a simplified mathematical model of the atmosphere, obtained a system with three degrees of freedom, and this computer-studied system behaves chaotically and unpredictably; to it corresponds a chaotic attractor of fractal type. In fact, in a chaotic system microscopic perturbations are enormously amplified and interfere with the macroscopic behavior of the system; it then happens that two neighboring orbits diverge more and more making any prediction about the behavior of the system impossible. The new "science of chaos" thus obtained aims to study "complex" and apparently disordered phenomena; it is then found that many phenomena of nature lie somewhere between determinism and indeterminism and between order and disorder. And this new situation is called "deterministic chaos." "We can therefore conclude that with the discovery of chaos and fractal attractors, there is a serious defeat of reductionism, according to which global properties are uniquely determined by local ones. In fact, interactions of components at a given scale can produce completely different global behavior, and this leads to a real revolution in 20th century physics, after that relativity and quantum physics.

B. Corà: Thank you Professor Arcidiacono. The speaking schedule included Professor Enrico Crispolti's talk, but he sent us a message from him, he is unable to be here with us, I will read it to you it is addressed to the Director of the Academy: "I am extremely sorry to have to communicate my absolute impossibility to be in Perugia this morning, for the study seminar dedicated to my friend Nuvolo. I am stuck here by an urgent necessity of primary relationship with the University of Siena related to the graduate school; a big job that unfortunately engages me for the whole day. Please excuse me to Nuvolo, and of course to the President as well as to the friends present. I wish you the best success for the seminar. Enrico Crispolti."

It is an opportunity for a debate, I would say that since, however, we have an inflexible schedule and timetable, and this timetable in fact already coincides, almost unpredictably - given the absence of Professor Crispolti - with the time to be devoted to communications. I understand that there are some, so much so that one has already been received here from Professor Moreno Barboni - who is a lecturer at this Academy - a communication concerning the idea of technical perfection, the reliance on the machine and the search for the autopoietic perfection of the work. I beg Professor Barboni to come and read his communication, please come instead of me. It will be followed by some other planned communications, Professor Bioli's and Dr. Pasqualina Bianchini's, and as and when those come to the table, I will read them.

Moreno Barboni: My communications are, by parallel forces and by necessity of synthesis, to

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do the filter that Corà specified, and again by necessity of synthesis I would open with two aphorisms by Georges Roditi, a French scholar who dedicated his life to his idea of perfection; the first aphorism is this “within this word, perfection, I would like us to see the verb to perfect and for it to acquire the same active sense: an effort, a work, and not the work completed.” I start from afar then I will come to Nuvolo’s work, if the computer revolution-as it is said in many quarters-brings forward and alkalizes a need for perfection that had already been manifested in the typographic revolution, which expressed a new confidence in the precision of mathematical constructions, figures and numbers, also bringing in the idea of perfection, that is, no longer putting it as divine correlation, but rather as mathematical and scientific reasoning. It is precisely in the sphere of Baroque culture that the philosophical thinking is based that allows for the distinction between the notion of technique and science, that is, technique may not be considered merely as an explanation of science, the latter understood as the possibility of control over the natural world; instead, Baroque technique stands as an analogical junction between science and art, and becomes - like contemporary neo-Baroque - a motif of possession, of transport, of passion. That is, technique becomes chemical and ethical value in its being able to be a part of being able to do something well, in its pragmatic doing that wants to strive for perfection; an idea this of perfection that is inspired in the specular hypnotism of the subject with the technological object, that is, with the machine whether typographic or silkscreen or electronic, which is now accepted as second nature, that is, virtual with present available; just as the Faunists believed that the exercise a technical craft brought man closer to nature, culture closer to nature. In this light one can read the ethics and poetics of Nuvolo-which, as the biography teaches, starts with a typographic role to arrive currently with the *Aftermandelbrot*, to become electronic or no longer typographic work. Thus Nuvolo’s path marks the transit from the non-alienating use of the mechanical machine to the creative use of the marvelous digital machine, increasingly able to see and predict, increasingly ingenious and organic, autopoietic like a living organism, self-reflexive like the artist’s work. Artist of historical silence from programmed perfection, which screens the possibilities of interdicting the man-machine, turning, however, to the imphotographic or inhumatic man-machine interaction, which as Philippe Kohn, director of *Immaginaria Monte Carlo*, has repeatedly pointed out, can escape the terminism of traditional computer interaction, in any case always partial, while instead the automatic and inhumatic expression can augment the concept of chance, as the Greek etymology of the term ‘automatic’, i.e., moving by itself, wants; and as Nuvolo’s nondeterministic fractals or *Aftermandelbrot*’s productive modes of production in particular demonstrate, the artist holds back the possibility of random error conducted by modifying the passionate circuit of programmed perfection, more than human rather than technical.

In technique, the etymology between art and science, between man and machine, is still at cross purposes, what is exhibited - in my opinion - is translated in Nuvolo’s work on the iconographic level or rather, as it is used to be said in graphic production, iconic and ideographic, since the images of synthesis one cannot use only the term iconic given its character as a mental object. I said, what has been expounded, is translated into the continuous visual search for the autopoietic perfection of the image, self-referential or self-similar as it may be, homonymous with Nuvolo’s passion for technical perfection, a passion undeniably assumed by the fact that he grafted on a Vigorelli sewing machine, pedal, an electric motor, a passion for technical perfection participating in the philosophy of the mirror mimicry of technology, and now with the double

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mimetic self of the binary language. In fact, the images produced by Nuvolo, whether they are pictorial and serotypal - e.g. *Modulari*, *Videogrammi*, or par excellence the *Oigroigs*, given also the reverse mirroring of the proper name - or whether they are fractal images of the *Aftermandelbrot*, go “in search of a perfect balance, an absolute equilibrium,” are Nuvolo’s words from ‘63. And through specular symmetry they pose themselves as autopoietic systems, as diffuse and open modules of a second nature in which the more or less stable and continuous control turbulence and graphic, kaleidoscopic and infinitesimal complexities; fractal images produced together with the baroque digital cathodic machine by the synthetic light, called today computer or sorter, conveying a rational induction of perfection that cannot deny chance, the indefinite, the concept of the inhumatic creation that wants to seek harmony in chaos.

I would end with the last aphorism, which I dedicate to Nuvolo whom I unfortunately know only through the catalog, “works of perfection do not obtain their reward only in the work, but also in the worker by realizing he realizes himself.”

B. Corà: I give the floor to Professor Iori.

Aldo Iori: So, with brief communication in this study seminar on Nuvolo’s work, I would like to propose some personal considerations that arise in thinking about the work of this artist, whose implications with the problems of repetition, color reproduction, sign and form I have already dealt with elsewhere, on the occasion of the anthological exhibition. I would like to reflect on Nuvolo’s work in relation to today’s specific theme, to the terms ‘chaos’ and ‘harmony’; according to Hesiod, “Chaos is the first, it is the chasm that opens between the earth and the sky, it is the gaping. The father of Erebo and Night, the principle from which all things arise. Chaos is never antithesis to the harmonious cosmos, never assimilable to disorder or disharmony, but a whole susceptible to ordering. “Armònia - on the other hand - is the daughter of the impetuous Ares and the goddess Ishtar, or the Greek Aphrodite, the dancer on the sea foam and who in turn is the daughter of Chaos.” Equation, then, between chaos and harmony, containment of one in the other, transition from one condition to another; from chaos to the harmony of the organization of things; to the harmony of the accommodation of a collage, of a *Scacco*; to the harmony of the analysis of the form of a form; from chaos to the harmony of the silk section of a *Serotipia*; of the harmony of the disintegration of the real and its reconstruction; in the inverse naming of one’s own name, to the harmony of the wonder of the triumph of the technological sign of death; from chaos to the harmony of a repetition of another’s nature, and of a fractal nature, with no apparent logic in itself, but with an underlying repetition and reproduction.

Between the first parent Chaos and the granddaughter Armònia, there is the mother Aphrodite - the goddess of beauty, the dancer on the sea foam - for Nuvolo, between chaos and harmony there is the machine; which metaphorically also dances on the chromatic wave, on the shoreline of the loom; the machine of beauty from which to generate harmony; the loom first, a contraption reinvented by Nuvolo in pocket form, and then increasingly sophisticated up to the computer; which is also a contraption, but as a cybernetic contraption it needs the ‘cibernetess,’ that is, the helmsman, the pilot, the one who shows the way. Nuvolo is the one who shows the way to the medium, the dumb servant, sometimes even a bit cunning, metabolizing though, and who responds to the needs of the work: he accumulates, enlarges, plumbs, multiplies, overturns,

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pushes and then recolors. The machine would allow him to repeat, but Nuvolo is interested in the mechanism, in the variation of the unicum of his gesture, of the intuition about form; the machine allows him to fathom and explore 720° - front, back, top, bottom, right, left - to arrive at the chaotic primal: to look at the law and find its application. Nuvolo has produced parts, plugs of a visual magmatic field that constitutes the pictorial space, the space in which - in my opinion - the fullness is always dominant, the fullness of a color, of a fielding, of a sign repetition, of a symmetry; and then in Nuvolo's work I have always noticed a kind of latent horror vacui in the painting, understood as a field, certainly as a visual magnetic field, but also as a container, as a continuous fragmentation and then recomposition of the balance between weights, between measures, where even the void, the white has a weight: it exists, fills and expands; the fullness of a white color as the fullness of a musical silence. *Horror vacui* of a tension between Pasolian skins of life, of a fragment of an insulting phrase and of a salute to the vate, honest redemption of the arid commodification of the sign; *horror vacui* of an eye, of a well-monitor, luminous 'aleph' where everything surfaces and where finally chaos sinks into the widening of a space-time of a few centimeters, in which between a before and an after the effort is made to understand and contain precisely the before and the after. Spatio-temporal *horror vacui*, where white is a white robe that imprisons and restrains the full, but also a blank page for a stitched scripture, or a place for a technological mustafa who repeats in prayer innumerable the name of his own sign-god.

The naming of things and people often originates from the depths of time: the Ascans, were a people who lived in a region that corresponds to present-day Eastern Libya; Greek historians tell us that these had dwellings in fortified, castle-cities, and were used in propitiatory festivals to symbolically kill their king in the form of a goat, as is still the case in the calendimage festivals, especially in northern Europe; the king-goat was skinned and the skin sewn and stretched over the shield.

A few days ago, I paused to look at St. Mark's in Venice, the ancient play of marble slabs in which Byzantine imperial skill had in large dimensions, about two meters by one, found the veins of marble; and had turned them over and over again, repeated until they covered walls and altars in a place where the whole, the accumulation, creates a poly-topo-cultural space. And I became aware of Nuvolo, of the *Oigroig*, of the *Aftermandelbrot*, and, perhaps, in those spurious marble fractals, in those veins, a deposit of our memory, where between heaven and earth, Kaos is once again conjugated with Harmony, terrible and often unbearable daughter of beauty.

B. Corà: Kudos for the beautiful report; indeed the finding of this morphology-which in the *Oigroigs* is very evident-there is for all Byzantine art even post-Roman art; even in **Sofia** the marbles equally are again cut, spaginated, compared, mirrored, and who knows that precisely it is not a memorable sediment to which one goes to enjoy, however remarkable interpreter. But I must say a Kubrickian relationship almost, with these sinkings, with these statements.

Here, the work goes on with the floor of those present; it would be interesting to know up to this moment what questions have aggregated, have found hospitality in your curiosity; we are here available, we ourselves also wonder about the work of Nuvolo; who is here present and we can already as of now -- albeit for a quarter of an hour, ten minutes -- open a first round of questions, if any.

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Nuvolo: This work [*Oigroig*, ed.] was in a way generated by nature, it is, let's say, a planetary observation of fluids, so by creating the colors in a certain way you are able to keep them from mixing with each other.

G. Arcidiacono: That is, does color observe the behavior of hydrodynamics?

Nuvolo: Yes, that's the one. Follow me, that debuts according to nature, there it is in a sense the intervention. If I make the copy, I make symmetry on one face; how mathematically I can interpret it I don't know, or geometrically I don't know. I do know that I wanted to achieve a harmonic and symmetrical form.

G. Arcidiacono: Yes, undoubtedly symmetry is related precisely...; that is, if I take regular polyhedra for example, they have many symmetries, and therefore the existence of these symmetries leads to a greater beauty of the polyhedron; by the way, an irregular polyhedron, unlike the regular one, has a whole internal harmony that the other one does not have. But that one is related to a greater existence of internal symmetries, so a group of movements takes place that brings it back on itself, it is more discontinuous and it is related to the structure of the regular polyhedron, and the more irregular it is the more are its symmetries.

F. Federici: As we were talking I realized-you saw that there were a lot of papers and it became very few-is that I made a very tight report, first because the tighter the better, and then because I wanted to stress one aspect, which was the biological one. I come back to it, as a Berkleyan, it's not that I really follow Berkley's lucid solipsistic madness, but I can't help but say that when we look at chaos or no chaos, when we look at those extraordinary things that Nuvolo does, we are using a perceptual set-up, a perceptual phenomenology, that obeys certain certain rules; I don't want to remind you here because you all know them-I see so many of my students, aimlessly, I spent time going around the theory of good form.

Perceptual mechanisms, constantly, lie within judgment, even artistic judgment that we also make, and within perception. I would take back for a moment the pendulum that Joseph was quoting, simply this evening take a bottle glass, have a pendulum take a hike, the pendulum takes a nice hike and draws a perfectly straight line, because if you hold it still it goes straight; put the glass in front of your eye, the pendulum starts to spin, well...I just wanted to remind you that there is no possibility of perception that is not mediated by the phenomenologies of perception that characterize everything we see. I don't want to bore anybody with **Bernays**, but I do want to remind you that the double-blind vision that opens every treatise on the philosophy of science and perception, there are I remind you of the laws of continuity - without bothering good form - the laws of closed form, so if I see four straight lines and I say they are four segments if I put them next to each other two by two, all I have to do is join the two that are in between for it to say I am seeing a rectangle or a square.

These perceptual mechanisms are always the initial element of mediating with the things we are seeing, why did I brutally slip into biology and talk about microcosm and macrocosm and start like that? But because Nuvolo inexorably in these things that he does reminds me that there are systems that become periodic in biology, there are systems that become repetitive, there are cir-

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cumstances that are not repetitive; in short, if you think about DNA -- who among us by now has not seen the helicoid -- you are confronted, if you think about the structural organization of matter, you are very often confronted with representations that metaphorically that kind of painting, that way of reasoning also, reminds you of. And then again, for a scholar of the brain and the functions of the brain, and for one who moreover has professed to be a Berkleyan, it is difficult to think that one can imagine, study, interpret, metabolize anything outside the patterns, the networks, the circumstances, the interplay of possibilities that the availability of neuronal association integration allows. With rules, however, that vastly override the exemplifications that are often in one's head when one thinks that for neuron reading is, for example it is the one that must 1+1 makes 2, the laws of good form show that in perceptual mechanisms, the sum of the parts is never in the final cortical representation the sum of the parts, but it is the sum of the more specific categorical component parts that are inside my mental archive. I threw it first into biology, brutally, simplifying and foreshortening precisely because, for me as a neurologist, one of the nodal points is that mathematical representations, artistic representations, abstractions, the universal interpretation of man stand with all reason in the structural organization, in the history of the historical-evolutionary process that has led to being able to represent the world to us. It is no coincidence that I indulged in an almost poetic quotation, for which I apologize, recalling that before there was a nervous system that could interpret the world, boulders fell without a clang; I said it unconsciously, the world had absolutely no color. But here I believe that more attention to the dynamics of perceptual phenomenologies unconsciously is operating in modern art, in a very heavy way.

B. Corà: I think there are still questions, Professor Passarella who may want to come here to the table and take the floor, who by the way is also valiantly grappling with genetics so the structure of the future.

Passarella: Yes exactly, in this regard I wanted to ask if, just happened to anyone to know about the future [laughing, ed], and by the way also the speeches of the mathematical professor, etc. because then basically, let's say, it's all together; that is my speech I want to make, my curiosity is just this. First of all, the professor talked about points, straight lines and planes, so they are to indicate space; here I at this point already wonder if you at this moment in four words could tell us what space is; because I honestly still don't understand it; by the way in this space is included matter, which here comes your question.

We see today that genetics is making tremendous progress, if there is a science that is making progress it is genetics, and in twenty years we will take note of that. [...] Yes, but my perplexity was this, that is to ask the professor here of biology, in their subject matter, in their manipulation, precisely is the subject matter there or is it not there? What happened to it? Because it is of recent curiosity about the news that in England, an embryo on the third day was manipulated by a genetic disease -- was manipulated, in the sense that a genetic disease was taken away from it -- on the third day, an embryo. Here I, layman, ask you but is there matter there or is there not? What do you guys manipulate? Thought, or spirit, or matter, or space? What do you do? Which is it? And I'm not interested in technique here, because technique is also in the service of science. And so that's where my toad is, which is inside - as a man that I wonder, I question, I solicit certain things; this is really one of those heavier things: matter. Why do I particularly

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feel this? Because today we, man, is dematerializing everything; we have come to virtual reality, to computerization, to these works that Nuvolo does. It is empire that we live the image, and the Chinese first said it that the image is worth more than a thousand words; however, today it seems to me that we are going too far; we want to dematerialize. That is, physicality, three-dimensionality; professor, the third dimension, depth is no longer there; in this case matter; here then I ask myself -- which then you are better suited to answer -- but is there or is there not this matter? Space is there, what is it? The weight? The volume? These things, these concepts, where do they go? Thank you.

B. Corà: Thank you.

F. Federici: Before Professor Arcidiacono talks to you about space, I have to-not give an answer because it would really be an unforgivable act of presumption to think of giving an answer-the science of this time is made up of questions, not answers. This is science: asking the questions; the answers are given by the teachers; even the elementary school teachers, because as it gets more complicated and the easier they are to do them-absolutely I have great respect; also because it is the only school body that works in our country, and it is also thanks to them-I was saying they give the rudiments, then, they give the answers but immediately after that science is made of questions. But you have to not by chance, I take a phrase of his, “a Chinese person could say that a picture is worth more than a thousand words,” a Westerner who is a talking animal would certainly not say that, predominantly, they for ten years of their life write iconomically, like in Japan, so they live an essential phase of existence through iconic representation; their writing, their talking even, predominantly for ten years of their life in the school is made by iconic representations; so of course a picture is worth more than a thousand words. But we who are animals of words--he who has more words is right, in the Western world the situation differently--this is to remind us that there is a specificity in the interpretation of matter. Right now I know that great physicists are struggling in the interpretation of matter saying $E=mc^2$ we are missing, and we see what we are missing: once we are missing time, once we are missing the enucendo process which is not exactly expressed, once we are missing information. We have friends--I am addressing Professor Saldarelli--who always talk about energy-matter-information where do we put the information; I always persist, when I find theoretical physicists talking, to say where do we put the brain? Which reads matter, energy and information-which interprets-but apart from that I would like to add one more thing; energy-matter-information the futurity. Earlier you phoned a theory of Teilhard de Chardin who talks about futuribles, I believe he was not a great scientist, I believe however that by the term futuribles he meant to refer to the historical-evolutionary process that matter carries within. So where does matter lie? It lies in its design, when a series of molecules--in chaos--did not put regularity in such a way that there was a ‘---’ inside and a ‘+++’ outside, maybe that’s how the first membrane was born--we are shamelessly simplifying--but at that moment out of chaos, within an organizational system, a design was born, a futurability, which matter always carries within.

The embryo, which makes this extraordinary history-exemplified by philosophers, with genesis, phylogeny, with big simplifications but also very suggestive-reminds us that from those cell groupings, which are indistinct; so much so that transpositions can be made in the experimental animal from the embryo so that if I know that when there is a spring (on par with spring) I

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can think of replacing a part, because then the parts that support it are capable of becoming what the other one that I removed would have become, which means that there is a planning and a design that is within the organization of the reciprocity of the parts, which are preparing a thing that; in the specific case that you mentioned that I am precisely recounting, there were. So energy-matter-information, historical-evolutionary process; this we carry with us in the interpretation of the meaning of matter; but also when we read it, when we formalize it; we must never forget that we are using an instrument that is made of the same matter that is thinking; in short, you have understood that I have relapsed into being Berkleyan deeply.

G. Arcidiacono: I was asked the question “what is space?”, the answer is very simple. One can repeat what St. Augustine says about time that “everyone knows, but if we ask no one knows”; first of all I have to distinguish between physical space and geometric space; for what concerns physical space we talk about vacuum, quantum vacuum full of energy and so on; if I refer to geometric space then there we are talking about metaphysics, for example if I talk about the straight line, a straight line is a non-physical entity because it is unfinished it has only one dimension which is length, so it is invisible, however the very important fact is that if I tell a kid-even an elementary school kid-‘the straight line’ no one asks me that he cannot imagine it. There is a fundamental fact that when in geometry you introduce the straight line everyone knows what the straight line is even though it is an infinite entity, this is because the human straight line can generate infinite entities, then it happens that we in geometry do not explain what the straight line is, because in geometry - starting from Hilbert - it happens that the fundamental geometric entities that before were inspired from nature by abstraction, I thought of a thread stretched between two points that I imagined stretched to infinity and very thin, in fact they are obtained intrinsically in the place A; when I imitate place A in symmetry that intrinsically contain all the functions of the fundamental entities, so the line is irreplicable because at two points one passes through, and so I name ‘A prob’ the problem of what the line is, I want it as a primitive concept. Then, geometry by detaching itself a little bit from the sensible world can move to hyperspace, because in fact I have not yet defined whether hyperspace exists or does not exist enough that logically we can study it, as a logical entity.

This is kind of the answer, in fact, even in physics the question “what is matter” is not answered; you can say that matter is given by its properties, that is part of the studies produced although for modern science its characteristic is to get closer and closer to philosophy; so it happens that when we leave in a philosophical field we meet with the big philosophical problems, so the sharp distinction between science and philosophy will happen, it cannot become so sharp when you are at the beginning.

B. Corà: Thank you. I wanted to suggest to Passarella, who is then an artist, so he measures with matter even if he says, “What is it? Is there or isn’t there?” that it might be possible to give space, in configuration courses like the following, that is, “space is the active time between oriented relations, relations between elementary matter. I see space as the active time between relations, of things or matter, oriented.”

F. Federici: I really like it, I would put an “inter” in front of it, interactive.

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G. Arcidiacono: Well, I could say that if there is one thing you cannot see it is space. The explanation is very simple, if there is one thing that you cannot see it is space and the reason is very simple after all, I would see space if I consider it as if it were infinite and then I would see space in this instant; however since the speed of light is finite and then I obviously have to simulate it in time; and so I see the past; that is what doesn't exist and I don't see space at all, I just see a section of space-time; fortunately though we didn't realize it we had to do geometry; because actually if I think about this only with geometry I could do it.

B. Corà: I wanted to ask you professor, I don't think that now if we can't see space, however actually then artists represent it, exemplify it, you can't add besides that 'inter' also the term "space is the feeling of time"; so this feeling doesn't make this representation impossible; because if we start only from the problem of eyes, of looking, we probably wouldn't arrive at representation; but it is said that blind people can represent, they can perceive things, they can somehow represent. This problem of feeling, that has to be replaced with seeing in the naming of space.

G. Arcidiacono: I can actually understand space, because because I have the very high volume it is clear that in the iterated vicinity it is almost instantaneous; that is strictly speaking I don't see the present; better if you turn your world as the object of existence, I see the present, the past is gone, the future is not there yet. If the speed of light is finite this is disrupted, because in fact if I have one thing I don't see it is the present, I simply see the past because everything I see has resulted in time, and so it is not for nothing that stars are seen as they were thousands of years ago, galaxies as they were millions of years ago, and space as it was billions of years ago. I actually see a cone of light, that is, I see a section of space-time, which is why as first said [...] "in probability take away the concept of existences," the concept of existences that used to be limited in space -- so there was the present, the past is gone, the future that is not there yet -- by replacing a leaf model of the universe, which are the various distances, with a pro-light model, then you have a mixing of space-time so that it is no longer possible to define the present for all contemporary observers; whereas in classical physics the present is the same for all contemporary observers, in quantum physics all contemporary observers have a different past and a different future; then, so much so that it substituted total resistance appeal and that is there is past-present-future in its totality, from the famous total existence lecture, which we recently published **Peter Debye's** selected lectures and the famous astrological **orbital theories**.

B. Corà: Thank you, I don't think I'm going to reprove Professor Arcidiacono because, according to the statement made by Federici - several tens of minutes ago - that is, an example of perceptual formulation is not possible, at least as far as an ascetic, a science or touching the point of the formal non-definiteness of the case, etc. etc.. however, it is contradicted, in a sense, this statement by the fact that the artist doesn't know and does.

N: No, he knows!!

B. Corà: So, he knows it and he does it; that is, the artist says he is happier and luckier because he does it. He gives this example, focuses it, stating this thing actually I don't really agree that the present is not representable, because for example there is a work of a contemporary artist of our...

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G. Arcidiacono: It is not that it is not representable, it is that strictly speaking we do not see it....

B. Corà: No, he shows it-this contemporary artist of ours-through experiences. The artist whose name I propose is Michelangelo Pistoletto, who used images on mirror-polished stainless steel surfaces. The first work that he made, in '62, is called *Il presente* and it depicts a human silhouette on this imperceptible threshold of mirror lucidity, and recently this artist -- rather polemically and aggressively -- has kept repeating that in front of this mirror there is always a present; and therefore the present is a mirror.

N: It is not present, even if I see myself in it, it has already passed.

G. Arcidiacono: Evidently it is fragmented, if I put the mirror at let's say 300 thousand kilometers I see it in a result of one second, even if I put it here it slips in a fraction of a second. Evidently this does not confuse us with ordinary life, because the speed of light is very high and therefore I quietly see the present; however, strictly speaking this is not true, because even an event here has slipped in time. It happens that there are multiple distances: there is the spatial distance, which is long when I touch the object; then there is the chronopont, spatiotemporal distance, which is long when I see the object; if I see a picture then the spatiotemporal distance which is $x_1 + x_2 + 0.2 - 52$ is long, then there is as it were two presences; there is a chronopont presence and there is spatial distance two, and then there is a second presence when I see it in which the spatiotemporal distance is long.

F. Federici: This is a catchphrase.

B. Corà: However, the present is also a datum concerning consciousness, and even before being physical it is a psychic datum. Accordingly....

G. Arcidiacono: Yes, I am talking about the mirror, which I see a split second later.

F. Federici: The present for a blind man does not exist, because he does not see the mirror. The catchphrase that I begin again is that of perception. In the meantime, it is inexorable to acquire a datum, if I make a double figure, present a face with on one side a very thick, scapular mustache and hair - like mine - and on the other side a bald and hairless - my students have seen this on many slides - if I present it for 25 milliseconds, for 25 milliseconds, I only see - because my right hemisphere is looking at the left hemispace in front of me - the hemiface I am looking at is the gentleman with the mustache and hair, the other one I ignore completely. An experiment that anyone can repeat, because by now misà 'sto scopio can be made at home with a few liras, but most importantly anyone who wants to come can come to the psychophilology workshop and see these beautiful figures drawn by **Rideg**, who came out of this institute, who half disappears, and I say I transform that half face into the completeness of what I see. So, I don't bring vases to either Arcidiacono or Corà, I say that inexorably every time a perceptual mechanism is set in motion, it is realized through the rules, the complex phenomenology of perception. That mirror, I have to see it, that image I have to see it; it's a very interesting rep-

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resentation; because it's a metaphor that calls into question a factor that we have ignored up to this moment here - Corà went into it - he said 'consciousness'. Here, consciousness no one had said, is there such a thing as perceptual consciousness? It is a seemingly brutal juxtaposition, but I make it because there is no doubt that within the process of perception there are mechanisms of comparison of categorization that go through the hypotheses of formal appreciation; earlier I did a day with the definition of the arc -- which comes from the greatest of scholars of this moment of the relations between brain and intelligence, from Marvin Minsky -- simply to say that the perceptual outcome is a game of probabilities and perceptual hypotheses that are completed, when they are compared with the engrams, with the catalog of perceptions; a very ugly exemplification, but basically correct; whether this catalog of perceptions and this orientation of the image that you see being compared, is called perceptual neurological consciousness I don't know, but certainly a very close first approach to the physical reading, of what we are asking about.

N: I agree with Professor Arcidiacono, in fact there is no possibility of seeing the present, because - as the professor said - the moment you see it, it is already past. Now let's talk about things, which the gentleman knows better than I do, that even in touching - as the professor was saying - it can be considered a present, there is no present; because the essential thing is that the feedback from the moment of touch to the moment it reaches the brain, that is perception, you are no longer in the present.

G. Arcidiacono: Of course, it is clear, however, that it is a distance.

B. Corà: Can it be measured?

G. Arcidiacono: Is a curved distance from the object.

N: So the present is not there. It is imperceptible.

F. Federici: Just because it is an elaborate, because perception, consciousness -- this time I am the one adopting it -- is an elaborate. There is a processing time, all the reality you will understand that the eye, which sees in parallel, which sees everything and everything together, gets by with times that are very long; because to get from the retina to the cortex is a walk that never ends; that is measured by doing the times of the **local** potential which is really a very long time. If then, the example you were bringing and the tactile sensorium walks in series, and not in parallel, and it walks very slowly and it is a very poor pathway; the times become really very long. But I think that - I threw it into biology earlier; just because it's difficult, at least for me, to think of a mental operation, a perceptual operation that can suppose itself without mediation of complicated processing of which we have some element that comes to us from technology-think-you all know that now you make neurological networks, you make networks of 'and or' cells that you put together that are capable of beginning to perceive, learning, a network-which I will show next year that starts to be thick for my baleful youngsters-analytics has learned to recognize; at first a wheel, then a metal segment, then now I recognize a bicycle. It is a process, which in the mind, man has already developed, with characteristics that are his own

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and are autonomous to him, that is, neither I nor Cocci taught him how to see the bicycle. In this process, so elementary, so shamefully distant, from the factualities of our brains -- we are really talking about something that is non-comparable, insultingly primitive -- well, even in this we see implementing centers of categorization; and here I am really talking about something that resembles, in an equally brutal exemplification, consciousness; that is, there are centers of categorization, for example, that have to say it is not a square, it belongs to the family of circles; however, I represent it with an ellipsoid, but if behind the ellipsoid I put a little boy with a stick who is walking it becomes a circle; and so on. These mechanisms of categorization, already in a game of six thousand neurons - neurons as it were - of six thousand squalid '*and or*' cells, which are a double switch, a simple switch, already this problem starts to arise, with formidable example of representation of the activity of the brain and, I always said brain using little the word 'mind,' because those who make these projects there are several differences -- technicians know it well -- between mimicking the mental process and mimicking the process of the brain. It is more advantageous for us to mimic the brain process; but as we mimic it we find that in the (for example) perceptual organization, quite quickly the brain process, of brain mimicry is done, takes on characteristics that tempt us to call them mental.

B. Corà: Thank you, I of course have a great number of questions, but I don't make the microphone mine rather; I yield it right away to the question that Giuseppe Galletti wants to ask.

Giuseppe Galletti: I made a work that is meant to emphasize the fact that time, time and its relationship practically, time that for each person different, the time of the rebel in one day, very different from the time of a man who performs his duties in a span of time that may be sixty years. I look at that work where there is my photograph and underneath "I hear you" it says, because the intent of the artist of photography has two times, because the artist does not see but hears; that is, all the senses hear except sight which does not see. This is to say, it is the artist's approach of seeing, that is, the picture does not see it but feels it.

Then I wanted to ask another question that is mainly a reflection, I also wrote it so as not to leave anything behind. There is a way and a way of understanding the concept of order, for some parts the order of the parts is the maximum disorder, in art however we have missed the order only to find it again so we enter into the symmetrical symmetry, into the game of causal impact that allows things the fact of being [...] and not put them in the servile state. Presence, it was said, is not man making poetry, but poetry exists a priori from what man makes, it is free; therefore the technique can be any but only man has the possibility of entering into the poetic flow, annihilating himself, or bringing it into the artistic field. The problematic is as Ingman says "beauty is not beautiful, what we call beauty is something else, order is something else, the cosmos is something else"; the problem is that every time we name this 'something else' we see it, we stereotype it. With this I end by saying: let us be free to betray this need of the naïve brain to range with everything it encounters.

B. Corà: Thank you, I don't know if there are any further questions. I would stop the various solicitations here, and suspend the work, of course it's 1:35 p.m., we have an appointment at 3:00 p.m., and we don't have much time left if anyone intends to eat a quick breakfast. The work resumes in the afternoon, and it would seem to me correct to give the floor immediately,

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in the afternoon, to Professor Saldarelli, begging Professor Mollo to postpone his speech; also because I have seen with what diligence and rigor Professor Saldarelli has kept his mouth shut; while he has had a chance to speak and instead he has been very disciplined; so let's give him the floor immediately in the afternoon because he will surely be able to put on the floor, on the carpet, many questions, many problems, his report will surely be a very pertinent one.

B. Corà: The schedule calls for Professor Mollo's intervention, but we had asked the professor himself and then Riccardo Saldarelli to change the order of intervention, also because a series of problems have come to the table that seem to call into question a painting technician, a connoisseur of the computer and then, this will perhaps allow precisely Professor Mollo to formulate the first balance, the first synthesis on the proper pedagogical level, of what is the answer, the projection on the tools of the study. The floor is given to the professor.

Riccardo Saldarelli: From the many stimuli and solicitations I received from the previous speeches, especially the speech made now by Corà, and touching on the technical aspect, which then is the area I am most concerned with. As I follow Nuvolo's work by reputation, today I had the pleasure of knowing his research directly, and for me the topics on the table are certainly two: the technical aspect in general and the computer. So, I would like to approach these two topics--also for conciseness--by reading points from interventions that I think are among the most concise on the subject going back two or three years, an example of course of a theoretical kind, but with a strong initial reflection, a systematic discourse on a subject that is coming up; with this I do not want to create early constraints on the belonging of Nuvolo's work to the sphere of computer-art, it is not up to me, it is not within my competence; [***] it is that his encounter with computer science is substantial, and his point of computer science is I would say original. [***] I quickly read these insights from a recounting of several years of experience, especially practical experience, and that they may perhaps be cues for interventions, questions and clarifications. Stipulated thus, "computer-art a new phase? Contributions for a Definition." The creative artistic process in its objectification can never disregard the technical component, and must therefore necessarily turn from time to time to the complex of technological minds available historically. In art, technical subjects require equally important languages and content design components and the elaboration of these languages and precisely the mastery of technical-scientific resources. In this view of the technical approach to art, in the world as it is understood, information technology finds its role as long as the set of new tools and reforms for creative work is connected to study art. [*** 15 s approx.]

[The contemporary artist, ed.] is forced to tread convoluted paths in an ambiguity for its own sake that forcibly becomes linguistic code in the moment--often, artificially constructed to satisfy modest musings, fragments of culture, or worse, scopiazzature of the latest fashionable current imposed by an increasingly unscrupulous and implacable art system. [***] I am neither an art critic, nor a historian, nor a philosopher, I am one who works on the front lines and marvels at these things on a daily basis -- and a teacher above all -- but the artist who in any case remains a witness and prophet, often a victim of the times, and above all a curious explorer and when he senses the need to change the rules of the game -- and for our age it seems that the times now require it -- triggers a semiological process of deviation of stagnant codes and thus produces new art. In the system of art, which uses fewer systems and communications for its dissemina-

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tion and the celebration of its products, there then appears art made precisely with the means of communication, the more sophisticated ones, those that are preserved of electromagnetic waves, of the informatics of telematics, and that are based on the theory of information and on technical-scientific principles of the digitization of images; on this front will probably take place the synthesis of all the expressive technologies that draw the image today. In order to guarantee in this [...] and at the same time technological barrier, biological fulfillment, individual sensitivity, aesthetic judgment, all the fundamental elements of artistic creativity, seemingly stifled by the electronic medium, the right relationship between the ideational moment and the technical-realization moment will always have to be taken into account, since the work of art springs from this subtle and difficult balance-as it [emerged this morning, ed.]. [***]

In fact, in addition to the subjective moment of ideation that is difficult to analyze and evaluate, because it falls within the phenomenology of the mental, the artist must necessarily undergo the technical steps of the materialization of the work; thus, each technique and each tool suggest different solutions to the individual sensibility and biology, thus contributing to a modification of styles, schools, subjects, etc. Well, the new computerized pictorial tools, in quotes, equally respond to these logics by forming the basis of new pictorial techniques and procedures, which deal with the widest freedoms [***]

[I conclude, ed.] my talk therefore, “computer-art” not only as a set of new technical tools at the artist’s disposal, but more importantly as a new interactive situation between expressive means and operator, it is possible to pose some interesting conditions for meaningfully talking about a new art:

1. Digital painting techniques considered as new painting techniques, are hypothetical[***]. By applications of state authorizations that have offered programmers a wealth of principles and methods for organizing a range of software tools, useful to the visual operator, albeit with the limitations imposed by a market aimed primarily at industrial use of such means. Thus, subject to fairly standardized coding, with the risk of habituation of convenience and electronic mannerisms. Such programs provide mainly pictorial two-dimensional approaches and end-times, on bitmaps and vector type for dimensional filters through graphical and pictorial tools, such as e.g., a brief synthesis, real electronic technographs with permeant skin ranges of various thicknesses, pulls and curvilinear and fills.

Directional currents are: palettes that can be modified at will, position functions (symmetry, mirror, tilting), kaleidoscope; [***], multiply, move, airbrush, zoom, overlay, page turn, etc. Functions page-makers, graphic compisitive: fonts of characters, clear functions for special effects that provide a **Rossinian technique**, materials [***], light, perspective ranges, polymateric and chromatic renderings, distorizations, animators, etc. They suffer from color variation and selection that starting from applications, and relying on advanced colorimetry studies allow the handling of thousands of colors if not millions by direct interventions on the digital arrays of selections.

To this already very rich, and perhaps somewhat complicated, sampling of available software is added that of hardware, dedicated input and output ranging from the acquisition periphery from: mouse, graphics tablet, scanner, camera, etc.; to the output ones: plotters, printers, etc.

But as I have previously mentioned “computer-art” is related not only to computer tools that emulate traditional ones, even enhancing them, to special effects however spectacular,

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[***] but also to that whole field of research related to algorithms and interactive or immediateness possibilities. [***]

2. Creative possibilities: in the creative process, the human artist processes image data perceived through the sensory peripherals of the nervous system - here the neurologist, friend, Federici will forgive me - [***]. It arises in the external world as ideational stimuli which through still mysterious mental processes, he receives from the fraction of memory and dream, then through technical procedures returns them to the physical world as objects of communication, [***] thus realizing the work.

Information technology makes it possible to similarly organize, systems of acquisition, processing and restitution in close analogy to the process described above; however, there is a substantial difference, the most stated way computer systems-as well as proposing themselves as a new technical tool-are in fact interactive technical-design tools, that is, capable of creatively stimulating the operator. The great speed and memory capacity, on the other hand, enabling the handling of immense data, both those acquired from the external environment and those directly produced in memo-synthetic form in a new, more complex way with greater processing and production capacity, contribute to the activation of new creative processes. [***]

3. Implementation of creativity: decisive spring of creativity has always been curiosity and exploratory urge. The exploratory artist has always thought in function of different worlds, that of nature, the abstract world of geometry and mathematics, the world of symbol, myth, the archetypal, the rational, the unconscious, the dream, or the phantasmal. Styles, currents, schools, manners--and here would open up a very interesting fact in chapter--have always given one to several worlds of reference, undertaking there according to the means at hand, exploration through languages, metalanguages, or transformations of models.

The artist while confronting socio-cultural and scientific resources of the subject has always had the courage for better or for worse, to push the creative processes by searching the secrets of the workshop for new means to wonder; one thinks to give just a few examples,-excuse me I am a Florentine, I have to necessarily go back a little bit, although the workshop is also that of Nuvolo today, it is that of the person who has the computer, it is that of the silk-screen printer with advanced technologies, but let us remember how the workshop was born-so one thinks, just to give a few examples to the earthquake caused by scientific discoveries in the 4-500s, perspective, the light painting of the Umbrian Piero della Francesca, the analog virtuosity of the Flemish painters, an anatomical drawing, then here put all you want [***]. The drama of the futurists, for example, in the effort to represent an unknown space-time interaction or to memories suggestions offered by the microscope, which allowed the artist to break into the crystalline structures of cellular organisms. Today it is analogue, but also computer science, we are allowed the exploration of new spaces; conditioned only by the ability to calculate planetary orbits or to locate new galaxies; or by the possibility of entering sub-atomic spaces, and so the human artist-always an explorer of new ways-is able to explore new micro- and macroscopic possibilities.

We have heard, today, about hyperspaces; it is recent the new space, beyond fractals, Haring's, it is the beauties of space of a new algorithm that a Russian scientist has come up with, I don't have the scientific details of course my sources of information are often computer magazines, the market is very fast, there are already software on this amazing new al-

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gorithm. [***]. Absolutely new situation, precisely, can now accede the artist with the tools of information technology, exploring simulated worlds, parts of synthetic forms regulated by mathematical laws, since his comical destiny is to use existing things, transforming them in an innovative, provocative and transgressive way. In his path of exploration, research and production, the artist makes art when - precisely, focusing moments of surprise - he succeeds with his work, albeit the result of a path established by itineraries and methods, to convey, by surprising, this intuitive surprise of his. [***]. Presumably information technology, alongside new formal models, and even new energies and synergies, presents the artist with new means of exploration and interactive inquiry; it can trigger processes of implementing creativity. There was still no talk of virtual reality when I was writing these things.

4. New design, the objective results are certainly different from those obtained with traditional techniques, and here precisely I would say the technical issue that we are going to address by talking about the work of Nuvolo, had posed the problem before this [***] art, non-art, multiple; then we can open - I would like to - [***] the debate on this point. The objective results are certainly different from those obtained by traditional techniques, and it is the gravest mistake to try to imitate these by computer means, as many are already doing by misrepresenting the real innovative possibilities of "computer-art."

The work of the computer artist, is basically the electronic image, made of a hitherto unknown matter and directly processed and compressed by him, moreover in its complexity it is only a false problem, however deserving of subsequent clarification and investigation elsewhere. Thus, this art in addition to being the result of new creative attitudes is made with a new material and in real time, and this is another reason that makes "computer-art" a new art; not excluding, then, the possibility that tools and methods equal to "computer-art" produce multimedia and polymathic effects on other contemporary artistic situations. And at this point, today '93, I speak of "art integral."

5. New approaches of today among all the possibilities of theoretical references related to computer science, which can be of valuable stimulus to the contemporary artist, besides those of the generation of synthetic images by means of algorithms, or of the randomization of shapes and colors, which implies random laws of mathematics, those offered by fractal geometry seem to me very suggestive. This new geometry that transcends the three references-which Professor Arcidiacono will excuse me if I make some mistakes-. [***]. This new geometry that transcends the three spatial references of Euclidean-Cartesian representation, composing a fractured environment according to series of continuous bifurcations enables the study and representation of complex and jagged geographic, topographic, landscape, and even biological morphologies; here while talking about fractals this morning, I was thinking about the great fractal skill of the painters of the 1300s [***, 10 s approx]. By clarifying the secret laws of chaos, or rather the recurring patterns of chaos, as formal and structural references of matter, we can consider such modifications depicting fractal images; one could thus say - thinking, for example, of the extraordinary structuring of lung alveoli, or of the orderly disorder of the course of foliage in the various plant ramifications - that matter itself today speaks the fractal language. This geometry also allows us to simulate synthetic landscapes, offering the artist the exploration of new worlds, forms, and colors that can, indeed, constitute important sources of visual research and production; such as perspective-and here I venture-for artists and practitioners [***]. Perspective, was one

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of the theoretical elements discussed by art historians, one of the fundamental new theoretical elements of the Renaissance, so can fractal geometry be taken as one of the possible theoretical foundations of a new art, and why not, a new Renaissance?

Here this was the text of '90.

[***]

Gaetano Mollo: So the representativeness and communication, because I think the centerpiece of the poem of art [***] is the symbolized reality, then decoded [***] express with technique, techne, and communicative intent, that which draws contact with the self of all where we find a message [***]. [I take, ed.] the initial provocation [***] I'm going to designate a little [***] chaos-harmony. If chaos and harmony [***] nothing exists, chaos cancels itself out, nothing exists that is not chaos, the syllogism comes to support [***] definition of chaos and harmony [***] can lead us to consider that all reality is [***] the combination of chaos and harmony [***] as an initial assumption, [***] everything arises from itself.

Second question, [***] the subject of painting. If painting is value [***] in itself, the points of the volcanic image [***], question about what is expressed, that is, if painting has value in itself, the artist becomes the one [***] who interprets in a cultural context [***] within these initial provocations, [***]. In the observations, of chaos and harmony we have to reflect [***] that there is between universal and [***] versus of the whole; one can focus on a microscopic aspect, harmony represents [***] the finding of elements that in themselves are decomposed - they may even be contradictory - but [***] they become synergistic, the first problem arises [***]. The problem is this: to see whether subjectivity; how the subjectivity of the artist, how the subjectivity of people can meet in objectivity; how chaos meets in harmony. Let me explain the problem for a moment, when we talk about art we talk about subjectivity; what is subjectivity? It is the self-activity of the human being, it is the perceptual attention [***] becoming propulsive toward something [***]. Of the subjectivity-objectivity relationship is that [***] timeless thinking, [***] of seeking harmony [***] fragmented reality [***] in the whole produces harmonic form; I read in the segments [***] the concept of the seriality of images [***] reality is commensurate beyond the partial self, through the [***] harmonic [***] search [***] of our reality, we would not be dismayed [***] if a need for harmonic meaning and therefore if there were not a perceptual, and therefore intuitive prior, what the artist does, of a harmony being sought [***]. As anything that is a means to this intuition of harmony [***] chaos is only different [***] proposes itself the original need for a [***] is however, if it is a perceptual prior the harmony, it becomes a [***] that is manifested by the expression [***] that a common path [***] is made that unites user and creator in the [***]. If we have to [***] in these terms, I always talk about a triangle [***] it is necessary the mode of manifesting [***] becomes reductivity of the message, the pathos becomes closure [***]. The problem actually seems to me that at this point [***] fragmented reality [***] we are immersed in a flood of [***] culture and we mean a range of knowledge that at best we flank [***]. The message chaos-harmony [***] this represents the margins within which [***] of person who lives, who suffers, who loves [***] diversified is called upon to recompose harmony by dilating and expanding [***] dilations, of expansions of a particular [***], search [***] balance between cultural stresses, existential cue and knowledges; it seems to me that this becomes ultimately, then, the [***] that

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***] the sense of a culture, beyond all the knowledge ***] of communication. Here is whether, ***] we can no longer today ***] the era of ***] art of the Greek world, where beauty ***] recovers my personal ***] is found in its ***] geometries, rewritten in them; that is, it is the understanding ***] that all of this, it seems to me that the post-modern our reality ***] of representing the ***] and the recovery of interiority, understood as verticality, ***]. While chaos becomes the manifestation ***], in the sense that the value of the problem ***] of meaning, of the search ***] for value of the person ***] in that sense. ***] of combining chaos and harmony, subjectivity and objectivity, ***] in a constant dilation ***] continue, may the ***] continue with this morning's provocation ***] stands as something that ***] placeable, probably in this ***] relationship with the cosmos ***] the possibility of understanding.

B. Corà: The speeches in the program of the proceedings have ended. At this point ***] with Nuvolo to which I would say that there may be ***] that each of us has formulated possibly listening to the various speakers; and I hope that there is sufficient material to meet and clash with the opinion of the speakers ***] of this postulate ***] that is to bring all our questions into this further ***] with Nuvolo ***] of the reports; and none of us presume to have deposited anything definitive and the same value as Nuvolo, the same dynamic that propels his exercise there are ***] to be able to engage, shall we say, with the problems we have put on the table. ***] I know that artists are usually the ones who ***] however, this is a forum for reflection, for confrontation, for discussion; so I would strongly urge those present to a generosity of exhibition. ***] my colleagues who have given me a lot of novelty, a lot of perplexity ***] up to Nuvolo for certain statements he made this morning, that is, I saw him for example agree with [Arcidiacono, ed.] ***], hard to think about, however ***] I also know characteristically the man, the artist I know how contradictory he is, I would like to know how much of participated in the session from the poetic point of view and how much scientific; I have many solicitations. I give the floor to those who are interested in speaking, raise your hand, state your name and come and state the problem. ***] many were writing ***] with notes in hand ***] then Karpüseeler, for example who was a worthy student of his cybernetic master, and then certainly ***].

Wilma Lok: ***] I think this can only be relative, because if I see half ***] of the space that was there, this is in chaos.

N: Nothing changes, that is, this is the famous speech ... [overlapping voices, ed.] Not in the sense of position, sense of policy ***]. From the point of view of the composition of the image, it is chaotic, it is not an image constructed from the point of view of the researched, of the drawn rather, but it establishes itself through that particular system of color processing, which is precisely that of fluid mechanics that we were talking about with the professor this morning, whereby they behave in a certain way and establish themselves in a certain situation; at this point they are transported into the medium. This is chaotic, because due all from this, it's random say it as you want, it's the same; it doesn't change anything at all, the term can be whatever you want; however, it's clear that it's born from laws that are ungovernable, that nobody here knows. But if I derive from this phenomenon, I derive as it happens in the butterfly inside the cocoon, which has its wings wrapped one on top of the other, and in the

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pigmentation of becoming large it matures all in the pigmentation, when the butterfly comes out of the cocoon the wings, because they have pigmented one glued to the other, the wings become symmetrical, perfectly symmetrical. And that's the process, it's not that it's a thing of great mystery, however it actually arises from a purely random phenomenon which is that of the left, pure artifice that as I had to get the right, it's a matter of the experience of being a painter, knowing how to work colors, knowing the behavior of fluids, all this and much more, however the image is formed by itself it has not been governed; therefore it's both automatic and chaotic; what happens by itself cannot be rational. Representing the nature of man, ... [overlapping voices and speech, ed.]

B. Corà: No, I have to give an order to the intervention. I think Wilma Lok wants to intervene, but first Professor Arcidiacono asks for a moment to bring a more precise definition to the chaotic phenomenon.

G. Arcidiacono: Yes, before we have a discussion on these topics it is important to clarify what is meant by 'chaotic phenomenon'; because otherwise then there are different languages whereby the brain means chaotic one thing and chaotic another. Then we can make an example of a non-chaotic phenomenon and an example of a chaotic one; a first example of a chaotic phenomenon, or rather a non-chaotic one, would be for example the motion of the planets around the sun: this kind of phenomenon is said to be nonchaotic in the sense that there is a possibility with the laws of mechanics to make a prediction in the future; that I - since the motion of the planets around the sun depends on Newton's law of gravitation - not only knowing this particular system I can give prediction even about the distant future, but also go back to the past; so it happens that I can reconstruct the whole history of the solar system from the distant past to the more distant future. Instead, a chaotic phenomenon would be one in which, small initial errors, in the knowledge of the initial condition, are amplified; here I can give you an example: if I pick up a stone and drop it, then in that case I knowing the initial position can calculate the trajectory, the law of motion and predict the phenomenon. There are some phenomena, however, that are strongly dependent on their initial condition, so all it takes is a very small error in the initial condition that produces a different result; just think that if I go to the top of a mountain and drop a stone, it is clear that all it takes is a very small variation to completely alter the trajectory-because it can fall like this, or like this, or like this...-and then it happens that the chaotic phenomenon is the one that is strongly bound by the initial condition, and so since the initial situation is always part of some error, if an error is amplified I can no longer predict anything. And then there are two phenomena; there is the phenomenon in which the error in the knowledge of the initial evolution is not amplified, and then in that case I can make long-range predictions, example for the motion of planets; on the other hand, there are cases in which a very small variation in the initial condition produces completely different phenomena, and then I can only make a short-range prediction, the more chaotic the phenomenon the shorter the deadline on the basis of which I can make a prediction; for example, meteorological phenomena are highly chaotic and therefore I can make predictions within a few days, and it is not a matter of computer power because it affects a theoretical impossibility; being chaotic phenomenon I cannot make predictions. Then chaotic phenomenon or not is closely related to predictability, so if the phenomenon is not chaotic then I can make the long-range prediction if the phenomenon is chaotic this I cannot do. It is clear that at this point I

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can't confuse the two types of phenomenon, because if everything was chaotic I couldn't do anything anymore, for example: the train, the train schedule and everything else, it looks chaotic and not the other way around fortunately many things are not chaotic and so I don't have to question everything, then I don't do anything anymore; in fact it happens that even if I haven't discovered the phenomenon of chaos, we can use the train and everything else.

And then we have to say that in fact, the fractal and the non-fractal come together, that is, if I take this Paul and consider it globally, I can observe it flat however that does not take away from the fact that it has a fractal structure, because if I observe it under the microscope it is no longer linear, and taking the microscope back the more fractals appear; however even though it has a fractal structure, seen from a distance, it is a plane. The same thing happens with the Earth, which if I see it from a distance is almost exactly a sphere, and therefore I can calculate the volume of the Earth and all that I am interested in, but if I get very close it becomes fractal; this shows that there is an interaction between the local and the global, so it happens locally it may be strongly fractal however globally it may not be, then it comes that, in fact, there are many phenomena for which I can give a prediction; if this did not happen then I try, otherwise I could not predict anything anymore. In fact it happens that those who study fractals by professional deformation see everything fractal, those who study organic matter - for example - see everything as a function of plasma, however from the partial point of view; in fact if I let myself be dazzled by the fractal in the end I don't believe anything anymore, and I don't see anything anymore. Many phenomena are perfectly predictable, and at the discovery of fractals they invented nothing.

B. Corà: Thank you, whoever is willing to step in please raise your hand and come forward. [***] maybe Karpüseeler.

Karpüseeler: [***] [I wanted to ask, ed] Nuvolo, if in your opinion, say, opening this famous painting there is something beautiful anyway, one of the questions. I thought the symmetry might produce a fascination in some way.

N: Sorry, first of all, the concept of beautiful is not important, that is in the sense that it is not a concept that suits not so much art but the way I see it, you can say interesting or less interesting, that it is exciting or less exciting, more exceptional, that it starts in an unpredictable way or that it can be forgotten or even thrown away.

K: So let's continue the question, you've discarded who knows how many images before you can say this one... [***]

N: Are you talking about the fractals or are you talking about the *Oigroig*?

K: It applies to both of us...

N: No, that is absolutely not true. The fractals you don't discard and the *Oigroigs* you may; because being precisely a result of random and governed processing up to a fairly low percentage, [***] that gives you the degree of fluidity necessary for the colors to blend up to a certain point [***]

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W. Lok: This in my opinion is a very big organization in randomness, that a composition is no longer random, it is no longer ... That is, it is order, it is not chaos.

N: But here it's not a question of making twelve or thirteen; here it's a question of determining in the operation you do whether you need, or need, a certain part of randomness or you don't need it, that's the whole thing; then the percentages don't matter. In some the percentages, for example, may be as much as 100 percent, and in others it may be 1 percent; but nothing changes, the operation is the same, you understand? In the sense that then it matters, in the end, always - this is in the whole field of artistic craftsmanship [***] - in which you choose, there you are the actor really, when you decide: yes I'm okay with that; in that moment you are the actor until before you are someone who worked and tried to get to a certain point and maybe got there or didn't get there; but in the moment you decide you got there, there in that moment you are an actor. [***]

K: I like to observe you more as an experimenter, in some moments of the work, because I saw that you experimented with various observations. I have not seen a strand as I have seen in other artists, what do you think this is due to? Because I have observed various positions, that is, you have brought techniques to a very high level however you have discarded a little bit of a possible strand that maybe was latent, I don't know.

N: We talked about this earlier, this morning, quite a bit... When I said it's the work that suggests the outcome to you, in the sense that you find yourself in a situation, even by chance; here you also have a percentage of chance right? Even in the most rational craft, in chess for example, where everything is calibrated and everything is done ... well, there is the beginning that is decisive that is random, so even the derivative - as the professor rightly said - if you start with a percentage of chaos, you go on and on, this chaos is amplified.

K: Professor, have you ever thought of going in, going to investigate more [***] different subjects, or ... for example I'm talking about me, now I wouldn't want to do ..., looking at the final language [***] would need information. Haven't you ever been tempted to have found [***]

N: No, because...but there is a reason, just because for the fact that my constitution, I am a researcher I am not an artist; if I will be then we see in short; however I am interested in things, every now and then I am interested in something; and once I have reached and finished the interest in that thing it is over, enough is enough; I cannot do another one, not even if I am commissioned to do it; enough is the rejection, closed one discourse if another one starts. Also because not pre-meditatedly, it's not that I say I do twelve then I stop; no, it may be that one day it happens to me that one thing interests me and then it's over that other talk and I start the other one.

But it's not that I've been very close, very close, to Capogrossi, who for me was one of the most vivid friends, all vivid characters from Tot, to Burri, Fazzini, ... you have to see the people I lived with; Capogrossi I respect him, I loved him, I worked with him, however, a life like his ... Capogrossi when he met you he would say, "How are you? Nuvolo are you okay?" "yes, yes" "I'm happy," here he was a happy man but with a strange kind of imagination, because he created a big personality from the pictorial point of view, it's super recognizable, Capogrossi you can recognize him from a kilometer of the street, so you have personality in the case-you say-but I was never in-

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terested in that, I never wanted that, I don't know, it's not that I regret doing it, not doing it, merits or demerits, it just didn't happen. I've moved on like that.

W. Lok: Can I ask something about [***] as a result of this? That [***] although maybe, its more of the form of the character as a researcher than another kind of work, I have difficulty that I believe that as an artist it is impossible not to choose all the time, that is one even if it is completely ... because I understand as you ... the computer one I don't understand myself though, talking about when [***] a flood of intentionality inside, and I believe that even if we artists if we do a difficult work, I find it hard to believe that I can make something unintentional. I think, even what you were saying this morning when this pattern now I can't remember which [***], first forms of life that then resembled this kind of thing; even there even if there was not the hand of God or man or whatever, but there must have been a fluid or a molecule, or something been there to do it, these clumped together and that other one didn't, I mean... there's never a non-intentionality if it wasn't in what you were saying, that in fractals when you just break everything up and at that point maybe it gets to a chaotic situation, I don't know.

F. Federici: [***] I know I am going to get reprimanded right away, by an expert [***]. If I put molecules in a space, and they are few, in a gas, I study their movement very quietly using the laws of elementary mathematics; when they move I have to use quantum physics because otherwise I can't. [***] I absolutely have to change. Now I don't think that with fractals I lose the vision of the bench, because I have these available, the wonder of the brain has it *crick* [***], that is I have to go back there but not for official duty, because this there is a categorization criterion, there is a scalar reading criterion, which is inside so when I interpret the world fractally I know that I am using the fractal scale, but I know that above the fractal scale we start from the microcosm to the macrocosm; I know very well that when I look under the microscope at an elephant cell I am not able to reconstruct the elephant if the only thing I see is an elephant liver cell or elephant skin, however, I know that I am acting within a scale of interpretation that is explaining to me a tissue aggregation that I do not know, but it is not the animal. If, however, in the case of the fractal it is the expansion to infinity that gives me a fractal representation, but I have an initial reading element, then I simply employ two scales, so it is less scientific than it sounds.

Whereas the answer to the first question, why half here or all there, again you have the *crick*.

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