

Space Time Physics and Fractality = Pete Weibel, Garnet Ord, Otto E. Rössle (IX) (2005)  
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be conservative, preferring the tidy well-kept routes of a civilized hierarchy. Anticipating the usual reluctance, I was surprised that my mischievous friend not only offered no resistance to exploring my path, he leaped over me like a gazelle and took off along the route in what I thought to be indecent haste. In vain I tried to slow him down, pointing out this treasured rock, that carefully assembled marker. But, as all who are lucky enough to have discussed physics with Mohamed will know, resistance is futile. Listening to Mohamed gambol along what I considered 'my path' was a revelation indeed. Mohamed never ambles, he leaps. The added height of those leaps allows him to see many things hidden to the average traveller. Although I knew and treasured the local details that Mohamed would cross in a single bound, I had never seen the surrounding country that he was able to see. Mohamed embedded my one-dimensional path in a landscape of higher dimension, and more intricate beauty. That landscape was riddled with the ideas and paths of many people, all woven into a coherent fabric by a gifted raconteur. Like the trip up the mountain to the hotel, I was thoroughly stretched to follow his enthusiastic pace, but in the process I saw the beauty of an inspired synthesis of ideas that would have otherwise been beyond my vision. Science is, in the end, a process of exploration. Few people have the combined talents and circumstances to explore more than a small patch of well-charted ground. One needs the intuition that is the scientist's compass, the knowledge and imagination that is his spy-glass, the technical skill to travel swiftly and safely, and finally the courage to visit, alone if necessary, territory that is overlooked or spurned by colleagues. Mohamed has all of these qualities in larger-than-life measure.

This special issue is from a few friends who rejoice in, and benefit from the inspiration of Mohamed's passion for Physics. It is a small but affectionate salute to our favourite Editor/Explorer-in-chief, on the occasion of his 60<sup>th</sup> birthday.

Garnet Ord  
Toronto  
October 5, 2003

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Cracking the Enigma of Space-Time (2005)

We all live in the yellow submarine - in the age of the telematic revolution. This is also the age in which science and art come close together again,

closer than at any other epoch since pre-paleolithic times. This time around, the unified view is no longer reserved to the caste of shamans and berdachs, however, but is perceived by everybody to be an inalienable right. The reunification lies right around the corner. Gödel, Turing, the computer and the DVD have created a new reality and riddle at the same time: To see ourselves imprinted into the fabric of the brick wall, like a human shadow burned into the ground after an atomic flash - Gödel's frightening insight. It deserves to be elucidated further as long as it is still fresh in our minds. This book brings together in one place some of the most dedicated workers in this new no-man's and nomad's land, all gathered to honor one of the most prolific minds in the Gödelian realm of the transfinite - Mohamed El Naschie. The symposium held at the Karlsruhe Media Lab in October 2003 paid tribute to the "cosmic computation" (David Finkelstein) initiated by this multifaceted fractal mind. His closest co-voyagers, Garnet Ord and Laurent Nottale, share with him the conviction that a path-integral-like view of the quantum enigma holds the key to a deeper understanding of the cosmos. The mark imposed by this approach on high-energy physics it was El Naschie's privilege to discover. An infinite-dimensional Cantor dust is - according to this view - the real fabric of nature. Being part of this "dust" (which despite its infinite dimensionality retains some biblical connotations) contracts you into becoming, in your own eyes, a three-dimensional body made up of particles in a 4-dimensional space-time. Carl-Friedrich von Weizsäcker's early challenge to explain why space has three dimensions and time has one, encouraged by Pauli and Weyl, has come closer to its resolution to date in the hands of this scientist. Not only the visible (and invisible string-theoretic) dimensionalities of space become deducible; even the fine structure constant itself and also the muon-electron mass ratio (to mention only one among many) can for the first time be predicted with infinite precision. "Thinking transfinite" in the spirit of Mandelbrot and the pre-Socratic philosopher Anaxagoras, the inventor of chaos theory who was not far from the ancient Egyptian tradition, proves amazingly successful to date. The only question not yet addressed in this book of laudatory contributions is: why is this so? We have no solid ground under our feet as is well known. There is almost nothing but emptiness - as if one were looking down from an orbiting spaceship all alone. Why does the fractal dust qualify as so solid a basis despite the fact that it is virtually nothing but holes, holes within holes, and so in infinitely many dimensions? We - the present introductory writers - have asked this question to Mohamed. Two possible answers took shape in the 3-D sounding board situation between the three of us, punctured by his laughter. Both are not mutually exclusive. The first is "faith." Clear thinking in physics (and elsewhere) is not possible without an absolute faith in a benevolence-beyond that is the hallmark of religion, as Einstein never tired to repeat in one way or the other. The real riddle

is "assignment" – someone (who?) is being given a place in a universe of consciousness and, within it, a universe of structures – dust as far as we can now tell. There is no water to swim in, in this medium. Science itself is only concerned with the least lively, shadow-like aspect – the Cartesian relations. All that we have to cling to is an interface (and the latter exists only for one moment, the now, which may turn out to be indestructible). When carefully looking through the meshes, we find other meshes in an infinite-dimensional continuum of holes, as it were. This is the quantum reality which now turns out to cover, not just the states of molecules and nuclei, but also everything below that level, even though nothing was thought to exist below that level until quite recently. The string flute itself is made of dust! This reality at the same time extends to the largest structures in the universe: There is nothing but voids beyond voids in all directions, both upstairs and downstairs (the scale relativity of Nottale). The path integral is weaving together lumps and dimensions and strings: Feynman's many paths extend the submicroscopic to the heavens. This unusual vision, borne out of faith in the determining force of the fragrance-giving instance, is the organizing center of this book. But there is a second insight arrived at in the above-mentioned sounding board situation. If the quantum riddle is so pervasive that even the rigid curtains of space and time are fractured and fractalized into infinitely many pieces and dimensions: could it be that this very fact can be explained once more on a further level? While many of El Naschie's string-theorist followers would be reluctant to seriously ponder the existence of an even more fundamental (exo) level of nature, the originator himself is not afraid of such a scenario. The interface view – the media-theoretic paradigm – likewise calls for the presence of a more outside level. Good old Boltzmannian rationalism – classical determinism – may (just may) still be lurking behind the infinitely complexified quantum world. While the great successes of Mohamed's let the desire for such a rationalist picture, in the footsteps of 18<sup>th</sup> century physicist and Jesuit priest Roger Joseph Boscovich, appear outdated at first sight, the revival of the interface idea in our current age of the computer game and telepresence (even after death) calls for a synthesis. There is always a hidden level – as the present book itself is living proof of. The dust of letters contained in it owes its existence to a hidden level: Lydia and Reimara inaugurated it and Anke made the symposium possible. Science is friendship just as art is friendship. Every user of an art museum pretends he or she does not see it *is* a joke. But everybody knows that art is a joke. Just as the smile of the toddler is, when he returns that of Mom's with his own unique mischievous grin. But then there is a second level on which the mutual pretense is transformed into genuine closeness of an infinitely reliable kind. Art is a smile that can be relied upon. The world, too, can smile, and so in infinitely many dimensions. Let us see whether the smile of Mohamed comes through in the splintered ramified

reflections that await you in the following pages.

Peter Weibel and Otto E. Rössler  
 Karlsruhe  
 November 6, 2004

### Symposium Announcement

On the occasion of the 60<sup>th</sup> birthday of Mohamed El Naschie the ZKM is organizing a symposium on "Space-Time Physics, Transfinite Mathematics, and Computer Art". Mohamed El Naschie was successful in deriving a model for the so-called multifractal space-time which allows to predict the mass of elementary particles and derive universal constants. The derivation of these constants is not possible through the "standard model" which is why the physicists search for extensions or modifications of this theory. The conference deals with problems of this kind and includes thereby new and controversially debated approaches. It also includes mathematical considerations that propose them-selves to be fruitfully used within space-time physics. Additionally, the symposium addresses the attempt to use artistic approaches to gain knowledge on space-time and it is dicussed which connections between physics and art exist.

Hans Diebner, Peter Weibel, Otto E. Rössler  
 Karlsruhe, October 2003