A Tip of the TOE

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In memoriam E. F. Dräcker

Abstract. Using standard methods from string theory, this paper presents a comprehensive survey about the most important aspects of the theory of sand. Special interest is put on the examination of the sand-wind duality and the interaction of ordinary (non-supersymmetric) sand with the heat field of the earth, as solution of the field inequalities of a stone. This will lead us, in a natural way, to completely new insights into the theory of sandstorms.

Keywords: many particle systems; string theory; field theory; quantum chaos; GRT; SUSY; thermal QFT; GRB; quantum cosmology; noncommutative QT;

1 Introduction

The matter of sand has ever since fascinated mankind. Already twenty thousand years ago attempts to classify the grainy zoo have been made, \[1\]. In the Cretaceous Age many advances with respect to sand have been undertaken, especially it has been proved by \[2\] that chalk and sand are—at a fundamental level—two manifestations of the same thing. Unfortunately, since the end of the Cretaceous Age, sand research activities suffered from a considerable lack of financial resources, a time period which is called the Big Sand Crisis (BSC). This led to the the well-known revolutionary movement “Every Scientist Needs a Camel”, \[3\]. After all, at least a few new concepts have been invented, among them the so-called wheel, which then, however, has been discarded due to its impracticability, \[4\]. (However, there are some
unteachable fanatics who still try to demonstrate the usefulness of wheels on sand in the annual Paris-Dakar competition.)

Some centuries after the BSC a completely new impulse came from ancient Lei Li Ga, [5], who was the first to put special interest in the dynamics of sand.

The so far highly disordered efforts in sand have been fibre bundled by the famous philosoph Goe-The, who formulated the central question of today’s complex theory of sand, [6]:

\[ \text{Herauszufinden, was den Sand im Innersten zusammenband.} \]

Starting from this point, many interesting theories about sand dynamics have been developed. One of the most ambitious (and ambiguous) models was the well-known sandstring theory developed by the old Egyptian priest Edua ’Wit X [7]. With the postulate of the non-existence of infinitely small grains of sand, several severe problems of ordinary sand-theory (e.g. incurable sand-divergencies, causality problems etc.) seemed to be repaired. However, over the millennia, this model did not bear any fruits in sand. (After all, there have been some interesting side results for weavers, in particular new techniques for knotting.) This led to a complete restart of research in the field of sand. Fortunately, at least some interesting questions have been solved independently of sandstring theory, [8], [9], [10].

Modern, post-string sand theories have also their origin in Egypt. In particular, a comprehensive quantum theory of the dynamics of sand dunes has been developed, [11], [12]. Piles of stones (so called “pyramides”) have been constructed for a macroscopic test of the dynamic theory, especially for the prominent dune-tunnel effect. However, the pyramid-models emerged as too roughly textured, so there could not be proven anything with these (although they are still very impressive). Indeed, experimental clues for the correctness of the Egyptian Theory of Quantum Sand Dynamics (ETQSD) has been found only recently by Swedish Inger Zeil, [13]. Of course, to people living in North-Africa, his results have always been obvious. However, as they aroused some interest outside the Big Desert, he eventually will receive the prize without any bells.

Presently, research in sand dynamics came to an interlocutory end with a stone's\(^3\) field inequalities, [14], which form the basis of our approach.

The paper is organized as follows. In section two, the main aspects of the standard sand-wind duality are recapitulated. In section three a stone's field inequalities (specialized for the heat kernel of the earth) are presented. From these fundamental considerations, section four will lead us in a natural way to a completely new and attractive theory of sandstorms. In section five

\(^2\)to be translated maybe as: To find out, what sand bound together in its inner.

\(^3\)Unfortunately, the authorship of this work is still unclear.
follows a brief conclusion and outlook with respect to some recent aspects of sand theory will be given.

2 Sand-Wind Duality

This section is devoted to a brief recapitulation of the sand-wind duality of grain dynamics. Since sand is quantized (‘grained’), one has to use the well-known cat-equation, which reads (in natural units)

\[ (W + V_H)|\text{sand}\rangle = -i \frac{\partial}{\partial t}|\text{sand}\rangle. \]

\( W \) is the wind operator, \( V_H \) stands for the heat field operator. We use the idempotency of sand dunes (two sand dunes thrown upon each other give again a sand dune, since the superfluous grains merely drain in the sea of sand, as introduced by the great wizard Pamdirac) and \( WV_H = V_HW = 0 \) (heat and wind never occur at the same time). Now, multiplying this equation by its complex conjugate and dressing the cat with its bra leads immediately to

\[ \langle \text{sand}|W|\text{sand}\rangle = \langle \text{sand}|(\frac{\partial}{\partial t})^2|\text{sand}\rangle. \]

Due to the quadratic time derivative on the right hand side of this equation, by interpreting the operators as states and the states as operators we can immediately read off the duality between sand and wind. Most interesting consequences of this phenomenon follow from the fact that a (sand theoretical) distinction between the sand-field and the wind-field is impossible. This is the basis of our modern understanding of sandstorms.

In classical sand theory, it has been believed that the genesis of sandstorms lies merely in the wind field, interacting with the grains of sand, pushing them up and around. Modern understanding of sandstorms using the sand-wind duality of grain dynamics, however, has taught that the wind is a mere manifestation of the sand field dynamics. Thus, the usual theory of sandstorms is simply that the interaction of the sand-wind-field with itself is sufficient to create a sandstorm. Indeed, it has been shown by [15] that the movement of the grains of sand functions as source term for the wind field, not the other way as suggested by classical theory: It’s the grains generating the wind.

So far, this is somewhat awkward but, after all, well understood. Unfortunately, combinig the principles of grain dynamics with the Relative Generality Theory of a stone, we will find that this simple, non-general model is not sufficient to a full understanding of sandstorms.
3 The Heatfield

In the preceding section we have deliberately assumed that the reader is familiar with some of the basic notions describing the coupling of wind to sand. However, in order to fully exploit the origin of the breakdown of sand-wind-duality in sandstorms, we shall need a more thorough understanding of the generalistic physics of sand with respect to the heat field, i.e. of a stone’s theory and its grainization. An excellent recent introduction can be found in [16] – in chapter 42, of course.

Let’s begin with a brief historical survey. As it is well known, the experiments of Michael’s son (an ethiopian sprinter) and a cheetah [17] have given a first evidence that nothing moves faster than sand and that all grains (in a sandstorm) have the same speed, at least within the experimental accuracy of that time. This led to a relatively special view of matters. However, it still remained unclear how such a theory could be combined with the interaction of wind, sand and heat in the spirit of the old ton theory [18]. Only a few millennia later, this problem has been solved in an ingeniously simple manner by a stone.

Obviously, the sand in the desert is rather hot, in fact even hotter than the air surrounding it. Up to a stone’s era many scientists desperately tried to understand this phenomenon. A stone turned it into a new paradigm instead. In brief, his idea can be stated as follows: The heat moves the grains, but the grains are the source for the heatfield at the same time. (If we could switch off the dynamics and wait long enough then the air would be as hot as the sand.) More quantitatively, a stone’s inequalities read

\[ T_{g}^{\mu\nu} \geq T_{w}^{\mu\nu}, \]  
\[ G^{\mu\nu} \approx T_{g}^{\mu\nu}, \]  

from which one immediately derives his famous saying “E=m ceh ceh”. (The ancient letter = has no analogue nowadays.) Note that the sand is still treated as a classical (in the sense of continuous) field (of characteristic zero) here. The coupling of the spin-2-heatfield to wind, which is spin-1, i.e. a vector-field, is described by the force \( F^{\mu} = h^{\mu\nu}W_{\nu} \) acting on the wind quanta.

Due to its many nontrivial predictions, the success of a stone’s theory was overwhelming. Among these predictions were the delay of the time shown by a sandglass in an external heatfield and, most striking, the deflection of light in heatfields, often referred to as “Fata Morgana”. (By the way, this effect is also the origin of the common misbelief that dromedars have two hunches.)

Even more so, it turned out that the grainization of this theory was no
great deal. A typical effect that can only be understood in the framework of the full theory of grain dynamics, as it is a typical grain effect of the sand-wind-interaction, is the movement of sandpiles. We have already given a detailed account of this application in the preceding section. We have also shown therein that the resulting sand-wind duality leads to our present understanding of the genesis of sandstorms.

But we also mentioned, that this model has some drawbacks to which we shall turn our attention now.

First of all and honestly speaking, the above described mechanism for the genesis of sandstorms is only of limited theoretical value. In fact, no one has ever been able to prove that such extreme states of the sand-wind-field like sandstorms really do exist. (Actually, it is not even clear, whether this theory describes anything realistic at all.) A modern researcher can hardly take a “problem” of this kind serious, of course, but unfortunately it is not the end of the story:

Evidently, there is only a finite amount of energy in the heatfield of the earth. It came as a big surprise, when it has been discovered that certain kinds of sandstorm, so called grain ray bursts (GRB) had energies seemingly exceeding this upper bound, if a stone’s (grainized) theory was valid in this regime.

For a few hundred years this discovery aroused a lot of confusion and many scientists even started to doubt the spherical shape of the earth, until Re-Ez remembered the forgotten singularity theorems of and , for the heatfield. The former, , has also shown that such singularities will “radiate” large amounts of sand.

Assuming that the GRBs stem from the creation of sand due to the presence of a singularity of the heatfield he overcame all problems and eventually caused the (long overlooked) second revolution in the field of sand.

In fact, it soon became clear that there do exist many visible singularities of the heatfield. For instance, the sun is nothing but such a singularity, arising periodically and then moving at the sky. Due to the emittance of sand, it disappears again after a certain time, depending on the state of the heatfield, i.e. the temperature. (In summer it will last longer than in winter.)

Quite recently, even the existence of a very massive heat-kernel in the center of earth has been established.

Most importantly and even more surprisingly, however, it turned out that many ordinary (non-GBR) sandstorms can be traced back to such singularities. This motivates our conjecture that all sandstorms are caused by

\[ \text{since a spin-2 grain, i.e. the heat quanta, appears without saying in the grainized theory} \]

\[ \text{Amusingly, this mechanism resulted in the ancient misbelief that the sun is made out of yellow sand.} \]
such singularities.

Finally, the interpretation of the genesis of sandstorms as caused by singularities also resolved another puzzle:

Since sand is fermionic (it obviously respects the exclusion principle and, of course, the grains have spin $\frac{1}{2}$) and interacts only via heat-interactions, the system should be stable, seemingly in contradiction to the existence of sandstorms. However, sandstorms are only a local instability in the superfield, just like oases [10]. (For this reason, the energy stored in a sandstorm does not exceed the maximal available energy.) Globally, the system is in equilibrium! This fact might be of some importance.

4 Sandstorms Revisited

So let’s assume that in the center of each sandstorm a singularity of the heatfield is sitting. As it is well known, in the eye of a (sand)storm the wind vanishes, and thus it is commonly believed that $WV_H = V_H W = 0$ holds even there. But that is wrong, since $V_H$ is infinite in the center of a sandstorm. Accordingly, the sand-wind-duality breaks down in this region, and “that is the poodle’s core” [6].

Before we can explore this fact and its consequences in detail we should describe the mechanism of the emergence of these singularities, however. This mechanism is quite similar to the mechanism discovered by Msw the Elder [21], when he tried to understand the so-called solar-new-tiro puzzle. (The problem why the sun emits so few sand, which is solved by a resonance mechanism. At the same time the Msw-resonance explains why the sun emerges only periodically and why it is red around the times of its appearance, respectively disappearance.)

Thus, we immediately infer that small fluctuations in the heatfield will eventually lead, by a similar resonance, to the emergence of a singularity if we apply the following well-established result [22]:

**Theorem 1.** Under the above assumptions, there exists a point $x \in \mathbb{R}^3$ in which the degree of singularity of the heatfield-distribution $\langle \text{sand}|h_{\mu\nu}|\text{sand} \rangle$ is strictly larger than $C_{\text{storm}}$.

Thus, the genesis of a sandstorm will be inevitable. Moreover, it is now evident, that the standard sand-wind duality is broken, viz.

$$\lim_{r \to x} \langle \text{sand}|V_H W|\text{sand} \rangle(r) \neq 0. \tag{5}$$

The objection that such a singularity has never been observed in experiments with non-GRBs can be ignored: People entering a sandstorm voluntarily should not be taken serious.
Hence, the grains in a sandstorm are driven by the wind! This is the most nontrivial and surprising result of this paper. It can and should be verified empirically.

5 Conclusion and Outlook

In this paper we presented in a highly suggestive and self-explaining way a new idea about the emergence of sandstorms. We have shown that the movement of the grainized sand is caused by the wind field. This result seems to be in consistency with the predictions of the original (but wrong) classical sand-theory. Note, however, that this “accordance” is not even qualitative: There are no similarities of the classical theory with our completely new and astonishing result (5).

Of course, this paper has only sketched some basic features of the new sand theory. A complete review is in preparation. There furthergoing questions about noncommutative sand, the super-connection between quicksand and worme holes and some quite interesting (although avantgardistic) new features in sand theory will be presented [23]. Moreover, we will overcome some of the flaws this paper is suffering from, e.g. a renormalization of the infantilities due to the self-citation [22] will be done. This works the following way: Assuming that the problem is already removed at the first order. Then it follows from an inductive proof that no infantilities will arise at any higher order due to recursive citations. Now, curing the problem at the first loop level is rather simple. This completes the proof of renormalizability of this work.

We should also admit that this work suffers from a considerable lack of computer assistance. Unfortunately, the current generation of the abacus (used here at the Pyramid College) seems unable to perform simulations of such complexity. Not to speak of resolving a heart-tree in the fog.

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Figure 1 (The so-called Ω⁻⁻-facsimile).