Discussion on P&G 11.4, 58-59 (2000), i.e. about the "Jamming surface"

P. Evesque

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Abstract :

Testimony #1 was produced to "la Cour administrative d'Appel" (CAA) in Paris; so the following correspondence is no more private but open to anybody and can be used by anybody refereeing to it. This paper PG11,58-59 (2000) was proposed for publication in Phys. Rev. Lett. which led to discussions and modifications. As these become free, due to the presentation to CAA, I report them here.
This is a quite good example of the wrong strategy of editors: They reject the paper, even knowing that data already published in the literature are wrong (a curve in a figure of Nature presents a wrong curvature), also because they want that bibliography shall be explained (and not only told).

Pacs # : 5.40 ; 45.70 ; 62.20 ; 83.70.Fn

The paper [1] was proposed for publication to Phys. Rev. Lett.. It discuss the validity of a Nature paper and list a bibliography unknown from the authors of the Nature paper.
The discussions show that a curve in, Nature is uncorrect. It explains different terminology, and brings new bibliography list …

It is demonstrate that Phys.-Rev- Lett. editor rejects the paper and considers it normal. So for him, it is not his work to transmit the correct information…

Question: how many paper published by Phys. Rev. Lett. uses the quoted Nature paper?
This is quite incorrect from a scientific editor.

References:

[1] P. Evesque: The jamming surface of granular matter Determined from soil mechanics results, P&G 11.4,58-59 (2000),
[2] A.J. Liu & S.R. Nagel, "Jamming is not cool anymore", *Nature* **396**, 21-22 (1998)

[3] http://defense-pierre-evesque.over-blog.com/; [3bis] 2ème réponse au CNRS (27/4/2016) via la Cour Administrative d'Appel de Paris (http://www.poudres-et-grains.eu/datas/suite_affaire_2/3rr-mem-22.4.16-CAA.pdf) which makes public the private peer-reviewing correspondence.
[4] http://poudres-et-grains.eu/datas/temoignages/Temoig-1_editionsCL-23-6-11.pdf , pp. 88-117

Article refusé PRL LZ 7720: P. Evesque ; Poudres & Grains 11 (4) 58-59 (décembre 2000); The jamming surface of granular matter determined from soil mechanics results

Cet article aété soumis le 17 décembre 2000, et rejeté le 24 Octobre 2001, avec des arguments qui ne m'ont pas satisfaits.
Il a été publié sans réel amendemant dans Poudres & Grains (P.Evesque, Poudres & Grains 11 (4) 58-59 (décembre 2000)).

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Châtenay, le 17 december 2000

The Physical Review Letters
1 research road
Box 9000
Ridge NY 11961-9000
USA

Objet

Dear Sirs,

Please find enclosed 4 copies of a paper entitled "Identification of the jamming surface using soil mechanics results", author Pierre Evesque, which I submit for publication to Phys. Rev. Lett.

Best regards

Pierre Evesque

Ecole Centrale Paris
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Identification of the jamming surface using soil mechanics results

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92295 CHATENAY-MALABRY, France,

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Abstract:

Classical soil mechanics results are used to propose the equation of the jamming transition surface of granular matter in the (σ, $1/\rho=v$) space, where ρ is the density, v the specific volume and σ the stress really supported by the grain structure. Taking axisymmetric conditions, labelling $q= \sigma_{11}- \sigma_{22}$ and $p=(\sigma_{11}+ \sigma_{22}+ \sigma_{33})/3$, and considering normal range of pressure (10 kPa-10MPa) the equation of the surface of jamming transition is $v=v_o- \lambda \ln(p/p_o)+ \lambda_d \ln(1+q^2/(Mp)^2)$; M is related to the friction angle, $\lambda$and λ_d are two constants which depend on soil characteristics.

PACS #: 45.70 , 64.70.Pf, 83.70.Fn

Jamming transition is a fundamental problem which attracts some interest from physicists recently since it has been addressed a parallel with the glass transition [1]. We do not want to discuss this last point here; but we just want to stress that some information on the jamming transition can be found already in technical literature, even if it is in different words most likely: for instance, the soil mechanics literature speaks of this problem within an other terminology, but it has already identified the law of variation of the minimum density that a soil can exhibit in statics and under a definite stress field. This may help physicists in their investigation. This is just what we want to report.

Consider a dry granular material (as sand) in static condition, submitted to an axial stress field expressed in the principal axis direction as $(\sigma_{11}, \sigma_{22}, \sigma_{33})$, with $\sigma_{11} > \sigma_{22}=\sigma_{33}$; it can be built at different density $\rho=1/v$. However, this density cannot be looser than a given value; this loosest state is called the "normally consolidated state" in the mechanics literature [2,3,4]; it is characterised by its specific volume v_{nc}. v_{nc} is found to depend on the stress field. Labelling $q=\sigma_{11}-\sigma_{22}$, $p=(\sigma_{11}+\sigma_{22}+\sigma_{33})/3$, $\eta=q/p$ and M the ratio q/p at the limit of plasticity, i.e. $M=6\sin\varphi/(3-\sin\varphi)$ with φ the friction angle, one gets the following equation for v_{nc} from experimental fit :

$$v_{nc}=v_{n0}-\lambda \ln(p/p_0) - \lambda_q \ln(1+\eta^2/M^2) \qquad (1)$$

where λ and λ_q are two constants which depend on material. The domain of validity of this equation is (10 kPa, 10 MPa). For smaller pressure range, experiments in micro-gravity experiments have to be performed and are currently being performed by NASA; it is probable that v_{n0} tends to a given limit. For pressure larger than 10 MPa, grain crushing occurs, modifying the v_{nc} law of variation; examples can be found in [3]. λ is about 0.06 granular matter and sands; an estimate of this value has been tentatively proposed from a microscopic modelling [4,5].

When granular matter is saturated with liquid, it is found experimentally that Eq. (1) still holds, but the stress field which has effectively to be considered in Eq. (1) is the effective stress, i.e. the one which is really carried by the grain structure. So owing to the so-called Terzaghi approximation, σ is then equal to the total stress σ_{tot} minus the liquid pressure u_w:

$$\sigma=\sigma_{tot}-u_w \qquad (2)$$

It is found that λ and λ_q does not depend on the presence of saturating liquid.

When considering clays saturated with water, similar results are still valid, and Eq. (1) holds, if Eq. (2) is taken into account. The main difference is that the values of λ and λ_q are a bit larger, since the material is more "compressible". The name "normally consolidated" comes from clays: indeed it is much more complicated to get loose sand samples than clay ones. Examples of behaviour of clays can be found in [3].

It is worth mentioning that the shape of the transition curve in the $(v=1/\rho, \sigma)$ space is convex instead of concave as proposed in ref. [1].

As a final remark, the ensemble of normally consolidated states forms what is called the Roscoe's surface in soil mechanics literature when $q/p=\eta<M$; It forms what is called the Hvorslev's surface when $q/p=\eta>M$. Both surfaces are parts of the same surface [5,6]. Knowing these notations may help physicists in finding more information.

Acknowledgements: CNES is thanked for partial funding.

References:

[1] A.J. Liu & S.R. Nagel, "Jamming is not cool anymore", Nature 396, 21-22 (1998)

[2] A.N. Schofield & C.P. Wroth, *Critical State of Soil mechanics*, Pergamon press, (1968)

P. Evesque, Testimony #1, CL MSSMat on 23 June 2011 p.92/238

[3] J. Biarez & P.Y. Hicher, *Elementary mechanics of soil behaviour*, (Balkema, Rotterdam, 1994)

[4] P. Evesque, "Eléments de Mécanique quasistatique des milieux granulaires mouillés ou secs", *poudres & grains* **NS1**, 1-155, (2000)

[5] P. Evesque, "A Micro-mechanical Modelling of the Pressure Dependence of the Void Index of a Granular Assembly", *poudres & grains* **10**, 6-16, (1999), http://prunier.mss.ecp.fr/poudres &grains

[6] P. Evesque, "Topology of the Roscoe's- and Hvorslev's- surfaces in the phase space of soil mechanics", *poudres & grains* **6**, 10-16, (1999), http://prunier.mss.ecp. fr/poudres &grains

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Châtenay, le 14 June 2001

The Physical Review Letters
1 research road
Box 9000
Ridge NY 11961-9000
USA

Objet : corrected version of # LZ 7720

Dear Sirs,

Please find enclosed 4 copies of the revised version of the paper entitled "Identification of the jamming surface using soil mechanics results", # LZ 7720, author Pierre Evesque, which I submit for publication to Phys. Rev. Lett.

I join also a response to the referee remarks.

I have modified the introduction in order to stress the new result: (i) the paper identifies the jamming transition states to the states called "normally consolidated states" in the soil mechanics literature. (ii) it gives the equation of the jamming transition states. (iii) it gives some keywords of the "soil mechanics literature" which can help physicists finding more information.

I did not find in the literature some reference stressing points i, ii or iii. So I do believe these results are quite new and deserve publication.

Best regards

Pierre Evesque

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Identification of the jamming surface

using soil mechanics results

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Abstract:

Results from classical soil mechanics studies are used to propose an equation for the jamming transition surface of granular matter in σ, $1/\rho=v$ space; in which ρ is the density, v the specific volume and σ the stress actually supported by the granular structure. Taking axisymmetric conditions, labelling $q= \sigma_{11}- \sigma_{22}$ and $p=(\sigma_{11}+ \sigma_{22}+ \sigma_{33})/3$, and considering a normal range of pressures from 10 kPa to 10MPa, then the equation describing the surface of jamming transition is $v=v_o-\lambda \ln(p/p_o)+ \lambda_d \ln(1+q^2/(Mp)^2)$; where M is related to the friction angle, and $\lambda$and λ_d are constants dependant on the soil characteristics.

PACS #: 45.70 , 64.70.Pf, 83.70.Fn

The jamming transition corresponds to the stress-density states under which an heterogeneous fluid starts "freezing", i.e. stops flowing as a normal liquid and develops a strength which enables it to sustain a static stress field. This transition is a fundamental problem that has recently been attracting interest from physicists due to comparisons with the glass transition [1]. We do not want to discuss the latter point here. We would like to stress that some information on the jamming transition is already available in the technical literature, even though it is described in different words. For example, although the soil mechanics literature does not speak of this problem, it has nevertheless already identified the static law describing the variation of the minimum density in a soil as a function of the applied stress field. Obviously, this stress-density state shall be assimilated to the stress-density state at which the jamming transition occurs for this materials. So, the results of soil mechanics may assist physicists in their investigations. This is just what we want to report. Of course, it requires to know the terminology used in soil mechanics. This is given in the following.

Consider a dry granular material (e.g. sand) under static conditions, and subject to an axial stress field. The latter can be expressed along the principal axis direction as (σ_{11}, σ_{22}, σ_{33}), with $\sigma_{11} > \sigma_{22}=\sigma_{33}$. It can exist at different densities, $\rho=\rho_s v_s/v$, *where* ρ_s *is the density of the bulk solid.* However, ρ, cannot be lower than a given value. In the mechanics literature this loosest state is called the "normally consolidated state" [2,3,4] and is characterised by its specific volume, *v, labelled* v_{nc}. The value of v_{nc} is found to depend on the stress field. Labelling $q=\sigma_{11}-\sigma_{22}$, $p=(\sigma_{11}+\sigma_{22}+\sigma_{33})/3$, $\eta=q/p$ and M the ratio q/p at the limit of plasticity, *i.e.* $M=6\sin\varphi/(3-\sin\varphi)$ with φ the friction angle, one gets from an experimental fit, the following expression for v_{nc} :

e, Testimony #1, CL MSSMat on 23 June 2011 p.96/238

$$v_{nc}=v_{nco}-\lambda \ln(p/p_o) - \lambda_d \ln(1+\eta^2/M^2) \qquad (1)$$

where λ and λ_d are two constants that depend on the material. The pressure range over which this equation is valid is from 10 kPa, 10 MPa. For lower pressures, experiments under micro-gravity conditions are required that are currently being carried out by NASA. At low pressures it is probable that v_{nc} tends to a given limit. For pressures larger than 10 MPa, grain crushing occurs, and this modifies the v_{nc} law mentioned above. Examples of this behaviour can be found in [3]. For granular matter and sands, the value of λ is about 0.06; an estimate of this value has been tentatively proposed from a microscopic model [4,5].

When granular matter is saturated with liquid, it is experimentally found that Eq. (1) still holds, but the stress field which needs to be considered in Eq. (1) is the effective stress, i.e. the one which is really supported by the grain structure. Owing to the so-called Terzaghi approximation, σ is then equal to the total stress σ_{tot} minus the liquid pressure u_w:

$$\sigma=\sigma_{tot}-u_w \qquad (2)$$

It is found that λ and λ_d do not depend on the presence of saturating liquid.

Similar conclusions hold for clays saturated with water, and Eq. (1) is valid provided that Eq. (2) is taken into account. The main difference is that the values of λ and λ_d are slightly larger, since the material is more "compressible". In fact the term "normally consolidated" comes from clays: indeed it is much more complicated to obtain loose sand samples than loose clay ones. Examples of the behaviour of clays can be found in [3].

It is worth mentioning that the shape of the transition curve in the ($v=1/\rho$, σ) space is convex and not concave as proposed in ref. [1].

As a final remark, the ensemble of "normally consolidated states" forms what is called in the soil mechanics literature, the Roscoe's surface *[2,4,7,10]* when $q/p=\eta<M$. When $q/p=\eta>M$, it forms what is called the Hvorslev's surface. Both surfaces are parts of the same

surface [4]. Knowing these notations *and keywords* may help physicists obtain more information, *but this does not suppress the necessity of reading, learning and thinking.*

For instance, Eq. (1) is just the combination of Eq. (2.10 bis) and (2.41) (p.79) of Britto & Gunn book [8]. Eq. (1) can be found in [3], (first Eq. of p.26 of [3]). Normal consolidation pertains to the list of keywords of [7], of [8] (indexing to pp. 173-174 of [8]) and of [9] (indexing to pp. 350-51). The Terzaghi principle is cited in [8] too. Experimental data on normal consolidation can be found in [3] and in [2], [10].

Acknowledgements: CNES is thanked for partial funding.

References:

[1] A.J. Liu & S.R. Nagel, "Jamming is not cool anymore", Nature 396, 21-22 (1998)

[2] A.N. Schofield & C.P. Wroth, *Critical State of Soil mechanics*, Pergamon press, (1968)

[3] J. Biarez & P.Y. Hicher, *Elementary mechanics of soil behaviour*, (Balkema, Rotterdam, 1994)

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[6] Encyclopedia of Fluid Mechanics (volume 4), Solids and gas solids flows, N.P. Cheremisinoff ed. , Gulf publishing company, 1986); one finds: (i) Eq. (12 p. 48: $\tau=\mu\sigma+\lambda$ exp[-B e] ; (ii) Definition of Roscoe and Hvorslev surface see Figs. 14,15,18)

[7] Ground Engineer's reference book, (F.G. Bell ed., Butterworth, 1987): see Fig. 3.27; see Eq. 3.71, Eq. 3.45 (p. 3/23) ; Eq. ($v=N-k\ ln(p')-l-k)ln(p'_p)$; Fig. 3.27; see in key-word lists: normal consolidation

[8] Britto and Gunn: Critical state soil mechanics via finite elements, John Wiley & sons, (1987) ; the key-word list contains the entree normal consolidation => p. 173-174; see Eq; 5.9 p. 174: $\lambda=Cc/2.303$; see also p.174 for the definition of $v=1+e$.

[9] R.F. Scott: Principles of soil Mechanics, (Addison-Wesley, London 1963), key-word lists quote "normal consolidation" and index it to pp. 350-51

[10] K.H. Roscoe, A.N. Schofield & C.P. Wroth, "On the yielding of soil", Geotechnique 8, 22, (1958)

Answer to referee remarks and objections:

1) **The parallel between the jamming transition (limit of the dynamics) and the normally consolidated state (limit of the static condition) has never been done before. If the referees do not agree, can they provide a reference, please. So the idea developed in the article is a new, or there is no new idea in the jamming transition too.**

   The introduction has been changed in order to make this point clearer.

2) Beside this, this paper is aimed at giving (i) the equation of the jamming transition states, (ii) at showing it is concave instead of convex and (iii) at giving key words to physicists who want to find more experimental data on the jamming transition from soil mechanics literature.

3) I have changed slightly the definition of v to be dimensionless. (Thanks for the help).

4) M is defined in the text via its relationship with q/σ_3 and with the friction angle φ. These quantities are defined in all text books [2,3,4] of soil mech.; similar definitions can be found in Technical encyclopaedia ref [6 & 7] see refs below.

5) Eq. (1) is just the combination of Eq. (2.10 bis) and (2.41) (p.79) of Britto & Gunn book [8]. Eq. (1) can be found in [3], (first Eq. of p.26 of [3]).

6) Normal consolidation pertains to the list of keywords of the book by Scott (indexing to it p. 173-174 of [9]) and of Britto & Gunn [8].

7) Experimental data on normal consolidation can be found in [3] and in [2], [10].

8) The paper gives also Keywords such as Terzaghi principle, as Roscoe's surface and Hvorslev's surface, since they are helpful.

9) New references are given:

New references:

[6] Encyclopedia of Fluid Mechanics (volume 4), Solids and gas solids flows, N.P. Cheremisinoff ed. , Gulf publishing company, 1986); one finds: (i) Eq. (12 p. 48: $\tau=\mu\sigma + \lambda \exp[-B e]$; (ii) Definition of Roscoe and Hvorslev surface see Figs. 14,15,18)

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[9] R.F. Scott: *Principles of soil Mechanics*, (Addison-Wesley, London 1963), see in key-word lists: normal consolidation => p; 350-51

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Châtenay, le 20 Septembre 2001

The Physical Review Letters
1 research road
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Objet : corrected version of # LZ 7720

Dear Sirs,

Please find enclosed 4 copies of the revised version of the paper entitled "Identification of the jamming surface using soil mechanics results", # LZ 7720, author Pierre Evesque, which I submit for publication to Phys. Rev. Lett.

I make appeal of your decision on August 30, 2001.

May I suggest as a third referee,

Prof. P.G. de Gennes, Collège de France, Paris,
Dr Didier Sornette, UCLA, and Nice (France)
Prof. S. Nagel Univ. Chicago

I join also a response to the referee remarks.

Referee B:

This paper makes the link between a problem to which a solution has not been given yet (i.e. the jamming transition) and experimental results.

I believe that reading is an active way of research.

NASA experiments is out of the scope of this paper.

Referee A:

This jamming-surface problem is an up-to-date problem, which interests physics literature.

There is no new physics, except that this paper shows an example, allows to introduce new data on the jamming transition,demonstrates that the surface is concave instead of convex, which was not known.

Nobody in the physics community was able to make the parallel prior this paper. Nobody in the mechanics community has made the parallel too, which means probably that the paper of Nagel et al. have not been understood by this community. I hope this paper will make the bridge between the two community.

Best regards

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Identification of the jamming surface

using soil mechanics results

P. Evesque

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PACS #: 45.70 , 64.70.Pf, 83.70.Fn

Third version

Submitted to PRL on 17/12/00; # LZ7720 Corrections after referee reports 20/5/2001

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where λ and λ_d are two constants which depend on material. The domain of validity of this equation is (10 kPa, 10 MPa). For smaller pressure range, experiments in micro-gravity experiments have to be performed and are currently being performed by NASA; it is probable that v_{nc} tends to a given limit. For pressure larger than 10 MPa, grain crushing occurs, modifying the v_{nc} law of variation; examples can be found in [3]. λ is about 0.06 granular

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[2] A.N. Schofield & C.P. Wroth, *Critical State of Soil mechanics*, Pergamon press, (1968)

[3] J. Biarez & P.Y. Hicher, *Elementary mechanics of soil behaviour*, (Balkema, Rotterdam, 1994)

[4] P. Evesque, "Eléments de Mécanique quasistatique des milieux granulaires mouillés ou secs", *poudres & grains* **NS1**, 1-155, (2000)

[5] P. Evesque, "A Micro-mechanical Modelling of the Pressure Dependence of the Void Index of a Granular Assembly", *poudres & grains* **10**, 6-16, (1999), http://prunier.mss.ecp.fr/poudres &grains

[6] Encyclopedia of Fluid Mechanics (volume 4), Solids and gas solids flows, N.P. Cheremisinoff ed. , Gulf publishing company, 1986); one finds: (i) Eq. (12 p. 48: $\tau=\mu\sigma + \lambda \exp[-B e]$; (ii) Definition of Roscoe and Hvorslev surface see Figs. 14,15,18)

[7] Ground Engineer's reference book, (F.G. Bell ed., Butterworth, 1987): see Fig. 3.27; see Eq. 3.71, Eq. 3.45 (p. 3/23) ; Eq. ($v=N-k \ln(p')-l-k)\ln(p'_p)$; Fig. 3.27; see in key-word lists: normal consolidation

[8] Britto and Gunn: *Critical state soil mechanics via finite elements*, John Wiley & sons, (1987) ; the key-word list contains the entree normal consolidation => p. 173-174; see Eq; 5.9 p. 174: $\lambda=Cc/2.303$; see also p.174 for the definition of $v=1+e$.

[9] R.F. Scott: *Principles of soil Mechanics*, (Addison-Wesley, London 1963), key-word lists quote "normal consolidation" and index it to pp. 350-51

[10] K.H. Roscoe, A.N. Schofield & C.P. Wroth, "On the yielding of soil", *Geotechnique* **8**, 22, (1958)

Submitted to PRL on 17/12/00; # LZ7720 Corrections after referee reports 20/5/2001

Answer to referees:

Answer to referees

The parallel between the jamming transition (limit of the dynamics) and the normally consolidated sate (limit of the static condition) has never been done before. So this idea is a new, or there is no new idea in the jamming transition too.

This paper is just aimed at giving key words to physicists who want to find more experimental data and explanation from soil mechanics literature on the jamming transition.

I have changed slightly the definition of v to be dimensionless.

M is defined in the text via its relationship with q/σ_3 and with the friction angle φ. These quantities are defined in all text books [2,3,4] of soil mech.; similar definitions can be found in Technical encyclopedia ref [6 & 7] see refs below.

Eq. (1) is just the combination of Eq. (2.10 bis) and (2.41) (p.79) of Britto & Gunn book [8]. Eq. (1) can be found in [3], (first Eq. of p.26 of [3]).

Normal consolidation pertains to the list of keywords of the book by Scott (indexing to it p. 173-174 of [9]) and of Britto & Gunn [8].

Experimental data on normal consolidation can be found in [3] and in [2], [10].

The paper gives also Keywods such as Terzaghi principle, as Roscoe's surface and Hvorslev's surface, since they are helpfull.

New references:

[6] Encyclopedia of Fluid Mechanics (volume 4), Solids and gas solids flows, N.P. Cheremisinoff ed. , Gulf publishing company, 1986); one finds: (i) Eq. (12 p. 48: $\tau=\mu\sigma + \lambda \exp[-B e]$; (ii) Definition of Roscoe and Hvorslev surface see Figs. 14,15,18)

[7] Ground Engineer's reference book, (F.G. Bell ed., Butterworth, 1987): see Fig. 3.27; see Eq. 3.71, Eq. 3.45 (p. 3/23) one gets cam clay Eq. ($v=N-k\ \ln(p')-l-k)\ln(p'_p)$; Fig. 3.27; see in key-word lists: normal consolidation

[8] Britto and Gunn: *Critical state soil mechanics via finite elements*, John Wiley & sons, (1987) see in key-word lists: normal consolidation => p. 173-174; see Eq; 5.9 p. 174: $\lambda=Cc/2.303$; see also p.174 for the definition of $v=1+e$.

[9] R.F. Scott: *Principles of soil Mechanics*, (Addison-Wesley, London 1963), see in key-word lists: normal consolidation => p; 350-51

[10] K.H. Roscoe, A.N. Schofield & C.P. Wroth, "On the yielding of soil", *Geotechnique* **8**, 22, (1958)

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Re: LZ7720
Identification of the jamming surface using soil mechanics results
by P. Evesque

Dr. P. Evesque
Ecole Cent. Paris, Lab. de
Mecanique, Sols, Struc., Mat.
Grande Voie des Vignes
F-92295 Chatenay
Malabry, Cedex FRANCE

1 May 2001

Dear Dr. Evesque:

The above manuscript has been reviewed by our referee(s).

The resulting reports include a critique which is sufficiently adverse that we cannot accept your paper on the basis of material now at hand. We enclose pertinent comments.

If you feel that you can overcome or refute the criticism, you may resubmit to Physical Review Letters. Please accompany any resubmittal by a summary of the changes made, and a brief response to all recommendations and criticisms.

Yours sincerely,

Reinhardt B. Schuhmann

Reinhardt B. Schuhmann
Associate Editor
Physical Review Letters

enc.

Referee A

This is, of course, an interesting Note, emphasizing that the behavior of sand piles (and more complex soil assemblies) have been already much studied by civil engineers, so that the empirical laws of soil failure are known and available and of probable interest to physicists concerned with 'fragile matter'.

I do think the letter approximately meets the PRL requirements of validity, importance and broad interest. It is not self-contained however,(what is a "friction angle", i.e., M??, ; what are the units of 1 ? (0.06 what? It should have a volume unit, or be unitless such as a fractional packing or something like that. The reader is not told. On the other hand, vnc is called a "specific volume", so it should be volume per gram???)

I do NOT think the letter meets the requirement of "Important Fundamental Research". The author has made a pertinent, interesting and I believe correct, connection between the soil mechanics literature and the timely topic of "jamming". While this is useful, there are no new results reported, so I don't think it is "new" in that sense.
Incidently, I spent several hours in the library pouring over soil mechanics books, such as

"Principles of Soil mechanics," R.F. Scott, Addison-Wesley, London, 1963.
"Critical State Soil Mechanics via Finite Elements", Britto and Gunn, Ellis Horwood series in Civil Engineering, (1987).
"Stress Strain Behavior of Soils", R.H.G. Parry Ed, 1971 (GT Foulis & Co, London)
"Shear Strength of Cohesive Soils", ASCE Proceedings, 1961
"Developments in Soil mechanics", Thomas Telford, London, 1983)

and I was unable to find equation 1 (though something near to it I did find). Please give a reference. I could also find nowhere the term "normally consolidated state". As it stands, it is still not too helpful for a physicist.

Publish as a comment?

Referee B

Identification of the jamming surface using soil mechanics results
P.Evesque (LZ7720)

Prof. Evesque has provided a very brief account explaining how some results that are apparently well known in the field of soil mechanics can be arranged to provide a description that is relevant to physicists. The investigation concerns the nature of a surface, the jamming surface, which separates qualitatively distinct kinds of particulate configurations. There is also a brief discussion that indicates the role and uffect of a liquid that saturates the space between the particles.

It is very difficult to evaluate this manuscript. Firstly there are very few details (for instance surrounding experimental support for equation (1) and the definition of p_0) and secondly the major 'result' appears to be an awareness of soil mechanics literature (supported by unexplained references to Terzaghi approximation, Roscoe's surface and Hvorslev's surface etc.). The manuscript contains several loose expressions, e.g. 'density can not be looser than a given value' and 'it is probable that v_{nc} tends to a given limit', which could be strengthened to increase the value of the account.

I cannot see how, in its present form, this Letter would contribute to an improved understanding of granular mechanics. It is unlikely that the level of description would make this account accessible to a general reader of Physical Review Letters. I cannot recommend publication.

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Re: LZ7720
Identification of the jamming surface using soil mechanics results
by P. Evesque

Dr. P. Evesque
Ecole Cent. Paris, Lab. de
Mecanique, Sols, Struc., Mat.
Grande Voie des Vignes
F-92295 Chatenay
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30 August 2001

Dear Dr. Evesque:

The above manuscript has been reviewed by our referee(s).

A critique drawn from the report(s) is enclosed. On this basis, we judge that the paper is not appropriate for Physical Review Letters, but might be suitable for publication in another journal, possibly with some revision. Therefore, we recommend that you submit your manuscript elsewhere. In accordance with our standard practice (see enclosed memo), this concludes our review of your manuscript.

Yours sincerely,

Jerome Malenfant
Senior Assistant Editor
Physical Review Letters

Second Report of Referee A (LZ7720 Evesque,P)

I have now read the author responses and the new revision several times. I agree with the author that he has identified a connection in the soil mechanics literature to the jamming transition in physics. I do not think that there is significant new physics in the connection as it is here presented (though new physics is certainly possible, if not indeed probable), since equation 1 (the basic result of the article) is completely empirical and the author does not discuss its physical basis or interpretation.

The present work supplies no new physical insights or information that I can see, though it does point out a promising and fruitful area of application for future results in "jamming" physics.

Second Report of Referee B

Identification of the jamming surface using soil mechanics results
P.Evesque (LZ7720)

This brief account expresses a belief that two surfaces in the phase space of dense particulate systems, identified by two different disciplines, are coincident. This surface separates static, or jammed, states of a particulate assembly from those that represent less dense systems and more mobile particles. The account is very brief and difficult to evaluate in isolation. An indication of the nature and strength of experimental support for equation (1) would improve the account. What experiments have been performed in the range 10 kPa to 10 Mpa and what experiments are being carried out at NASA? The cross-disciplinary identification facilitates the author to form an equation for the 'jamming' surface but it is difficult to assess the validity of the equation in the new (physics) regime. Whilst the argument is plausible it does not demonstrate how the initial conjecture has been evaluated? Although the account could be considered novel it is not clear that it is reporting 'substantial research' and, therefore, does not satisfy the criteria for publication in Physical Review Letters. I cannot recommend publication.

Date: Wed, 24 Oct 2001 15:13:55 -0400 (EDT)
From: Physical Review Letters <prl@ridge.aps.org>
To: evesque@mssmat.ecp.fr
Cc: PRL@ridge.aps.org
Subject: RE: LZ7720

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Re: LZ7720
Identification of the jamming surface using soil mechanics results
By: P. Evesque

Dear Dr. Evesque,

The complete file concerning the above manuscript has been reviewed by a Divisional Associate Editor. The enclosed comments advise against publication in Physical Review Letters. The Editors accept this advice.

Your appeal has been considered, and our decision to reject is maintained.

Sincerely yours,

Robert Garisto
Senior Assistant Editor
Physical Review Letters
Email: prl@aps.org
Fax: 631-591-4141

P. Evesque, Testimony #1, CL MSSMat on 23 June 2011 p.116/238

Report of Divisional Associate Editor (LZ7720 Evesque,P)

This paper makes a connection between results in soil mechanics and the jamming transition in granular matter. The author admits the paper is mostly a form of literature research. There is are new results reported, only an attempt to make known to the physics community some results from the field of soil mechanics. This information might be worthwhile as part of a longer research paper or maybe as a very short paper in a specialized granular matter journal, but certainly does not conform to the criteria for publication in PRL, namely new original research of broad interest. Thus, I see no reason to overturn the recommendations of both reviewers to reject this paper for publication in PRL.

-- Jan Tobochnik, Physics Chair
Departments of Physics and Computer Science Editor,
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J. Tobochnik
Divisional Associate Editor