



PETER ESHUIS

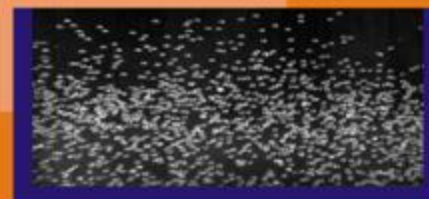
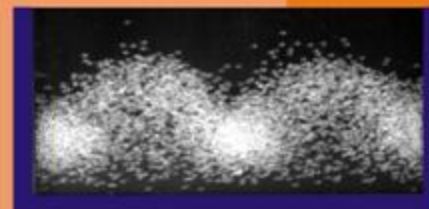
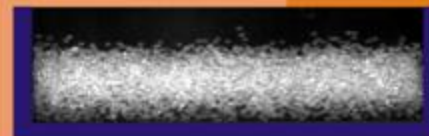
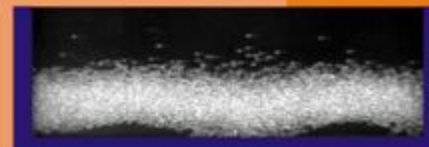
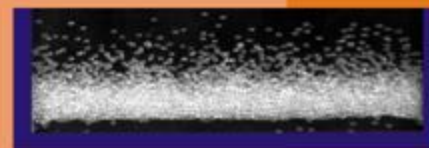
This thesis is the result of four years work in the Physics of Fluids group of Prof. Detlef Lohse at the University of Twente, and partly at the University of Patras with Prof. Ko van der Weele.

Vertically shaken granular matter shows very attractive collective phenomena (see the pictures on this cover), which are studied in this thesis by a combination of experiments, numerical simulations and theoretical analysis.

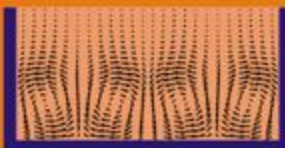
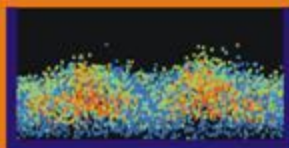
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COLLECTIVE PHENOMENA IN VERTICALLY SHAKEN GRANULAR MATTER

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Collective Phenomena
in vertically shaken
Granular Matter



Collectieve Verschijnselen
in vertikaal geschudde
Granulaire Materie

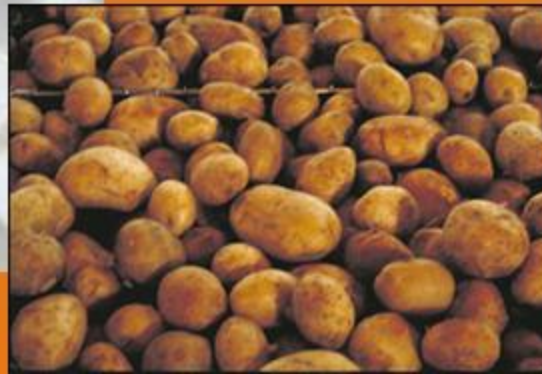


Schudden met Korrels

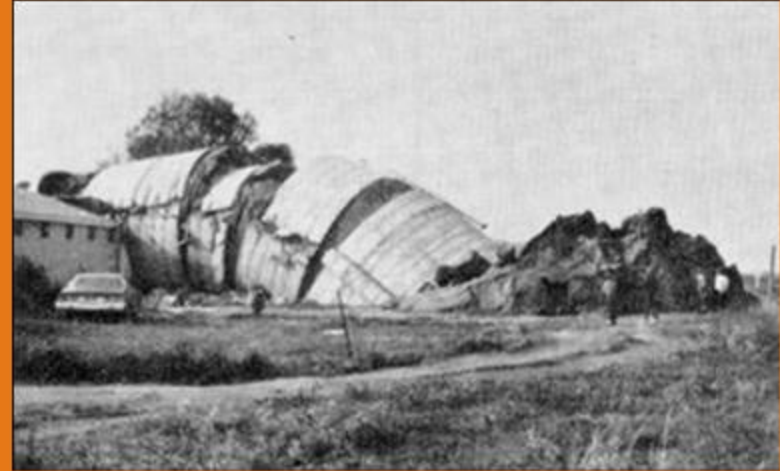
Wat is granulaire materie?



Wat is granulaire materie?



Waarom deze materie bestuderen?

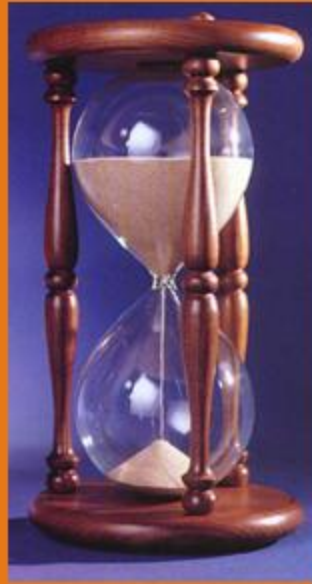


±€500 miljard per jaar aan energie verspild



Fundamenteel onderzoek:
beschrijven met hydrodynamische
(vloeistof-theoretische) modellen

Granulaire verschijningsvormen:



vaste stof

vloeistof

gas

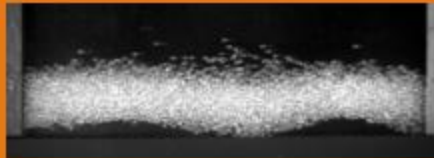
Granulaire materie gedraagt zich als een vaste stof, vloeistof, gas of een combinatie:

H2: Fase diagram

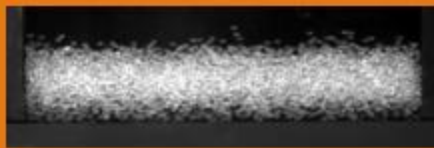
Harder schudden
↓



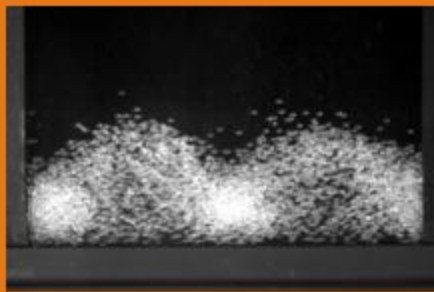
Bouncing bed



Undulations (staande golf)



Gran. Leidenfrost effect (H3)

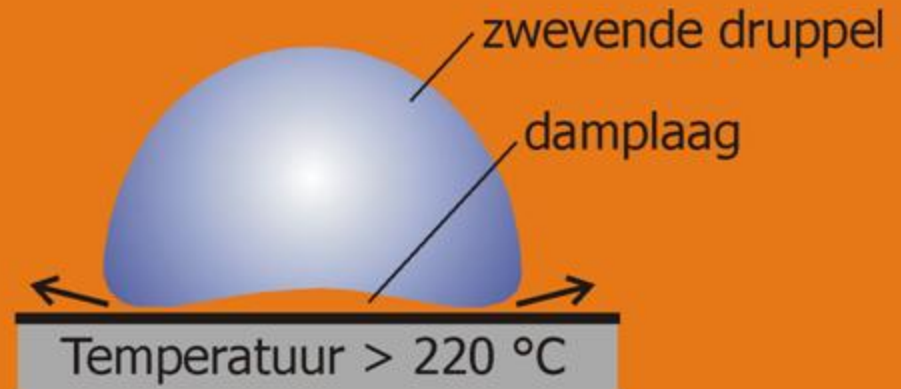
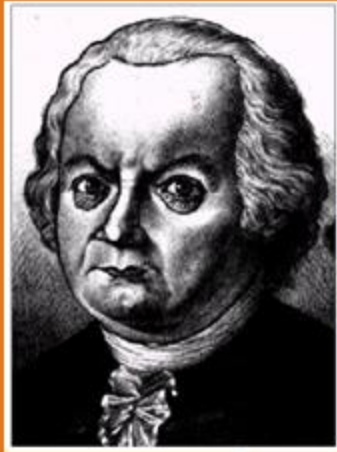


Convectie (H4)

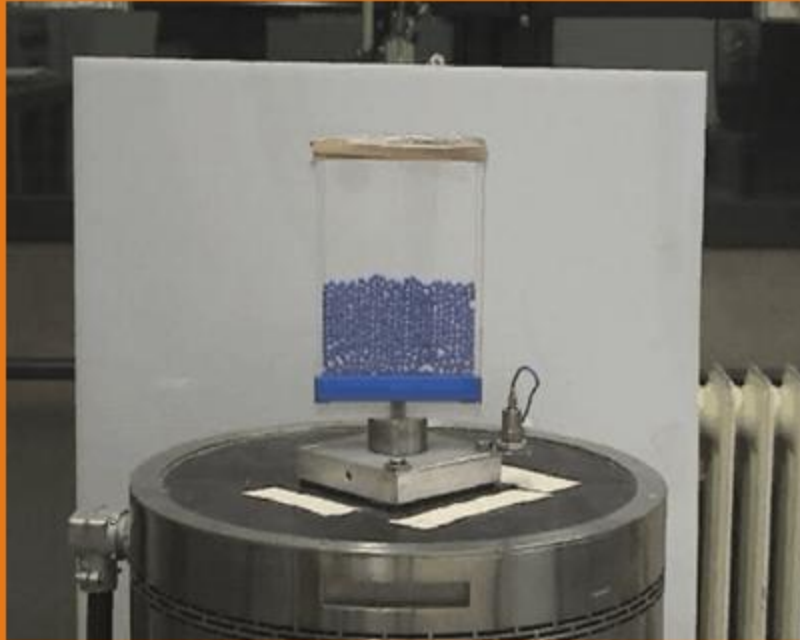


Granulair gas

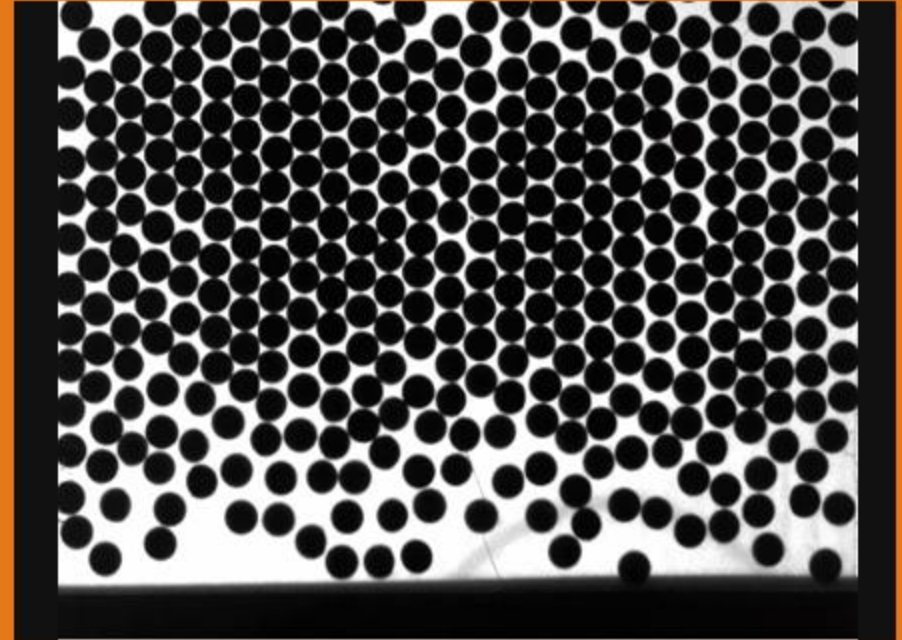
Johann Gottlob Leidenfrost (1756)



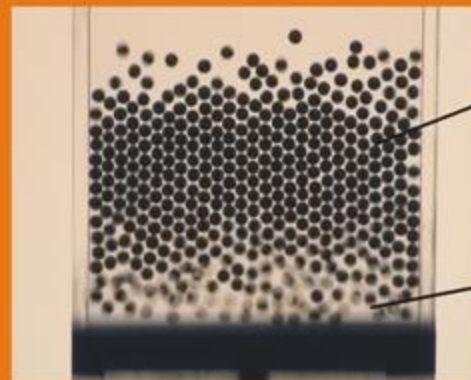
H3: Granulair Leidenfrost effect



normale snelheidsopname



hoge-snelheidsopname



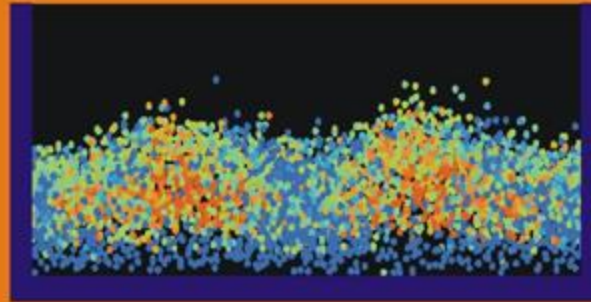
zwevend cluster

gasachtige laag

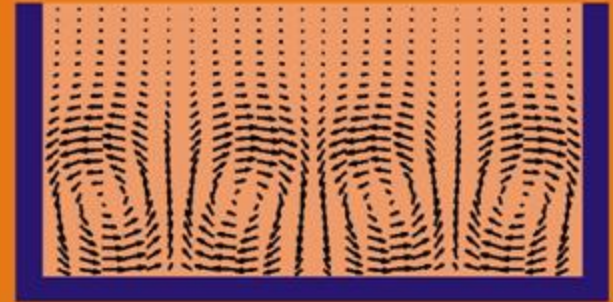
H4: Convectie



experiment



simulatie



theorie

Convectie-rollen, net als in een pan water die je aan de kook brengt.

H5: Horizontale buis met deeltjes

Flipboek rechts (oneven pagina's):



Inelastische botsingen:
energieverlies.

Flipboek links (even pagina's):



Elastische botsingen:
géén verlies.

Inelastische botsingen → Cluster

H6: Granulaire ratchet

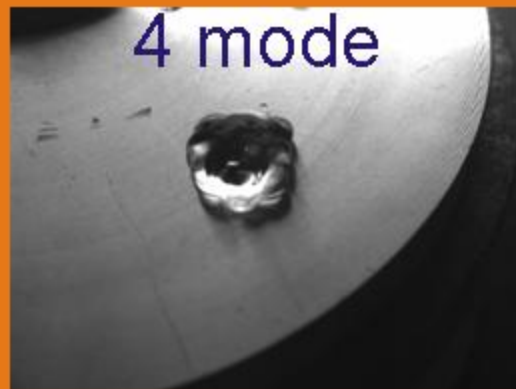
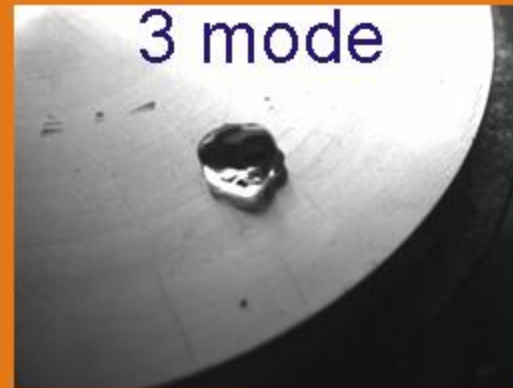


Granulair gas: willekeurige beweging



Molentje heeft voorkeurs-draairichting:
Ratchet effect

H7: Leidenfrost sterren



Temperatuur plaat hoger dan 320°C :
oscillerende Leidenfrost sterren

Conclusie

Hydrodynamische modellen beschrijven met succes de effecten die in vertikaal geschudde granulaire materie waar te nemen zijn.



Belangrijke stap richting een beschrijving van granulaire materialen in het algemeen.

Veel plezier!





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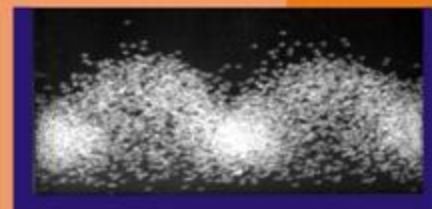
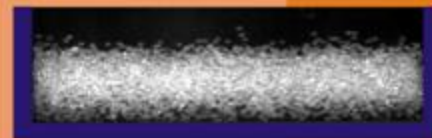
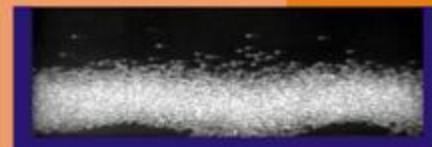
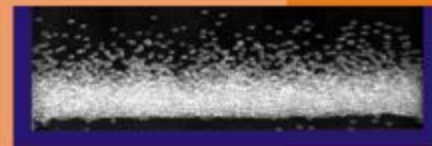
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