E-NEWSLETTER

August 2015 issue

THE SOCIETY OF ACOUSTICS SINGAPORE

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Year of Registration: 1989

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I CONFERENCE NEWS

Fellow members of the Society may like to take note of the following:

Western Pacific Acoustics Conference(WESPAC)

Date**:** **6-9 December 2015**

Venue**:** **Grand Copthorne Waterfront**

Organiser: Society of Acoustics(Singapore)

The committee wishes to extend a warm welcome for interested parties without any paper submission to attend the conference to study and keep in touch with the latest developments in the field. Register now to enjoy the early bird fee.

Key Dates

- 15 July 2015 – Notification of acceptance / Online registration opens
- 31 Aug 2015 – Early bird deadline closes
- 15 Sep 2015 Deadline for Submission of Fulllength paper
- 15 Oct 2015 – Deadline for authors to register
- 1 Dec 2015 – Online registration closes**

Delegate Fees – UPDATED

Type of Payment	Early Bird (before 15 Aug 2015)	Normal (before 1 Dec 2015)	On Site (from 6Dec2015)
Full registration fee (member (IIAV, ASA, ASJ, etc)	SGD900	SGD1,000	SGD1,200
Full registration fee (non-member)	SGD990	SGD1,090	SGD1,200
Student	SGD450	SGD550	SGD650
Extra Paper	SGD150	SGD150	NA
Extra Banquet Ticket	SGD150	SGD150	SGD250

Extra for Welcome Reception	SGD50	SGD50	SGD80

Website will be announced soon. Please send enquiries to: wsgan@metaultrasound..com

II. ANNONCEMENTS

The Society of Acoustics will be sending out invoices to members with outstanding membership subscriptions. Members are encouraged to make payment in support of the Society.

The E-Newsletters will be made available to industrial contacts in an effort to promote the activities of the Society.

The Society is also exploring the possibility of organising talks and other professional events in collaboration with acoustic societies of other countries.

Membership Certificates will soon be made available to all members who had made full payments of membership dues

The Society aims to increase membership by inviting all persons, including those from the institution of higher learning and other related societies such as the Institute of Architects, Singapore and the members of the mechanical engineering division of the Institution of Engineers, Singapore who are qualified in the various field of Acoustics to join our Society.
We are especially keen to invite students to join our society and we are establishing the Youth Chapter soon.

III. MEMBERSHIP SUBSCRIPTION

Fellow	S$70
Member	S$50
Associate	S$30
Student	S$15
Corporate	S$200

FEE BASED ON ANNUAL RATE

FOR MORE INFORMATION PLEASE CONTACT: Dr.Gan at email: wsgan@metaultrasound..com

Application form: ( ) Member ( ) Associate

1) Name: _____

2) Address: _____

Fax: _____ E-mail: _____

3) Degrees (Institutions and dates):

_____

4) Employment (with dates):

_____

5) Signature & Date: _____

IV NEW BOOK ON ACOUSTICS AND VIBRATION

Acoustical Imaging: Techniques & Applications for Engineers by Woon Siong Gan

Hardback | 440 pages | June 2012 | ISBN 978-0-470-66160-4
£85.00 | €98.80 | $140.00
John Wiley & Sons

The technology of acoustical imaging has advanced rapidly over the last sixty years, and now represents a sophisticated technique applied to a wide range of fields including non-destructive testing, medical imaging, underwater imaging and SONAR, and geophysical exploration. Acoustical Imaging: Techniques and Applications for Engineers introduces the basic physics of acoustics and acoustical imaging, before progressing to more advanced topics such as 3D and 4D
imaging, elasticity theory, gauge invariance property of acoustic equation of motion and acoustic metamaterials. The author draws together the different technologies in sonar, seismic and ultrasound imaging, highlighting the similarities between topic areas and their common underlying theory.
Key features:
♦ Comprehensively covers all of the important applications of acoustical imaging.
♦ Introduces the gauge invariance property of acoustic equation of motion, and symmetry properties of acoustic fields with applications
in the elastic constants of isotropic solids, time reversal acoustics, negative refraction, double negative acoustical metamaterial and acoustical cloaking.
♦ Contains up to date treatments on latest theories of sound propagation in random media,
including statistical treatment and chaos theory.
♦ Includes a chapter devoted to new acoustics based on metamaterials, a field founded by

the author, including a new theory of elasticity and new theory of sound propagation in solids and fluids and tremendous potential in several novel applications.
Covers the hot topics on acoustical imaging including time reversal acoustics, negative refraction and acoustical cloaking.
Acoustical Imaging: Techniques and Applications for Engineers is a comprehensive reference on acoustical imaging and forms a valuable resource for engineers, researchers,
senior undergraduate and graduate students

V.ARTICLE

Role of Sound Wave in the Ultimate Model of the Universe and the Grand Unification of the Four Fundamental Forces of Nature

By Woon Siong Gan

In Einstein theory of general relativity, gravity is treated as a phenomenon resulting from the curvature of spacetime. This curvature is caused by the presence of mass. Generally, the more mass that is contained within a given volume of spacetime, the greater the curvature of spacetime will be at the boundary of this volume. As objects with mass move around in spacetime, the curvature changes to reflect the changed location of those objects. In cetain circumstances, accelerating objects generate changes in this curvature, which propagates outwards at the speed of light in a wavelike manner. These propagating phenomena are known as gravitational waves(GW).

Gravitational wave(GW) is a product of phase transition from sound wave to GW during the early universe. Cavitation during a first order phase transition which may have occurred in the early universe as a consequence of QCD or electroweak interaction would have provided gravitational radiation in two ways: by generating acoustic noise in relation with plasma and by perturbing the expansion law on large scales [1].

A range of phenomena such as inflation, topological defects amd phase transition may lead to an observable GW signals across a wide range of frequencies[2]. Hindmarsh et al[2] confirmed that the

dominant source of GW is sound wave generated by the expanding bubbles of the low temperature phase. They reduce the original physical system to a model consisting of a scalar order parameter field coupled to an ideal fluid.

Large scale energy fluctuation in universe attract baryon and photon. Their streaming motion and compression generate sound waves[2]. The main source of the GWs produced by a phase transition is therefore the sound wave the bubbles make. Hindmarsh et al[2] find that the compressional waves(sound waves) in the fluid continue to be a source of GWs long after the bubbles have merged. For a wide range of models, the main source of the GWs produced by a phased transition is therefore the sound the bubbles make.

GW results from the nucleation, expansion and collision of bubbles of the low temperature phase for phase transition strengths and bubble wall velocities, covering many cases of interests. The compressional wave in the fluid continue to be a source of GWs long after the bubbles have merged[2].

Energy in compressional wave remains constant after bubbles have merged. The bubble collisions generate GW [2]. The GWs are governed by the compressional wave in the fluids. The source of gravitational radiation came from a phase transition-sound[2]. First order phase transition is provided by the nucleation,growth and merger of bubbles of the low temperature phase. The collision of the bubbles is a violent process and both scaler order parameter & the fluid of light particles generate GW[2]. The generation of GW continues long after the merger is completed and the scaler field has relaxed to its new equilibrium value. The GWs are sourced by the compressional waves in the fluid.

Inhomogeneities associated with the cosmological QCD and electroweak phase transitions produce hydrodynamical perturbations, longitudinal sound and rotation. So the conversion of sound wave into GWs can be summarized as three steps: (1)production of sound from inhomogeneities,(2)inverse acoustic cascade, focusing sound wave population towards small momenta,(3)the final conversion of sounds into the GW[3}. The mechanisms producing sound is still not understood.

However, sound wave as a source of GW confirms the mechanical nature of GW and hence the mechanical nature of the gravitational force described by Einstein's theory of general relativity. In the grand unification of the four fundamental forces of nature, the first three forces of electromagnetic force and strong and weak nuclear forces are all originated from the generalized Maxwell's equations and so are electromagnetic in nature. Gravitational force on the other hand, is mechanical in nature. Phase transition can play a mediation and reconciliation role between the electromagnetic force and the mechanical force in the form of phase transition from the electromagnetic force to the mechanical force. I feel that the difficulties in unifying the first three forces with the gravitationl is not the scale problem that the gravitational force is much weaker than the other three forces but is due to fundamentally difference in their nature., first three are electromagnetic and the last one is mechanical.

References

1.C J Hogan, Gravitational radiation from cosmological phase transition, Mon.Not.Roy.Astron.Soc.,218,629,1986.

2.M Hindmarsh, S J Huber, K Rummukainen, and D J Weir, Gravitational wave from the sound of a first order phase transition, Phy Rev Lett, 112,041301, 2014.

3.Tigran Kalaydzhyan and Edward Shuryak, Gravity waves generated by sounds from big bang phase transition, Technical report from the Department of Physics & Astronomy, Stony Brook University, 2015.

VI.REPORT ON CONFERENCES

Jubilee Conference 2014

On 25 July 2014 just before the AGM of the Society, the society organised the Jubilee Conference to celebrate the 25th anniversary of the founding of the Society of Acoustics(Singapore). There were some eight papers presented.

ICSV 22

The ICSV22 was held in Florence, Italy from 12 -16 July 2015. It was an overwhelming

with some 1,200 participants and 850 papers presented and 50 exhibitors. Our society will be bidding to host the ICSV 2019 in Singapore.

VII. USEFUL LINKS

Bodies

www.mom.gov.sg

www.nea.gov.sg

Technical and Research Sites

Corporate Sites

www.metaultrasound.com

www.noisecontrols.com

(The Society welcomes interested parties to contribute relevant websites to the above e useful links. For more information, please contact us. Thank you.)

Disclaimers

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