ing. Such processing requires calibration using an adjacent area of normal skin to insure the visualization of the dermal/fat interface. An investigator blind to the clinical findings interpreted the ultrasound results and predicted the type of burn visualized and whether or not the burn could heal without surgical intervention. Evaluating over 500 burn sites in some 100 patients, noncontact ultrasound showed an accuracy of 96% while standard clinical assessment showed an accuracy of 80%. The sensitivity for noncontact ultrasound was 100% compared to a sensitivity for standard clinical assessment of 65%. The specificity for ultrasound was 92% compared to a specificity for clinical assessment of 96%. The lower specificity for ultrasound may be a result of the fact that patient management was determined by clinical assessment alone. In any case, our study clearly demonstrates that noncontact ultrasonic imaging can be used for the rapid and accurate assessment of thermal injury, including the measurement of burn depth, with no patient discomfort. Our method is applicable to a conventional clinical environment as well as a battlefield situation and should prove particularly effective for large scale medical triage.

8.6 **Representation of solutions to wave equation with X waves,** Jian-yu Lu and Anjun Liu, *Ultrasound Laboratory, Department of Bioengineering, The University of Toledo, Toledo, OH 43606.*

Limited diffraction beams such as X waves are a new type of waves that can propagate to an infinite distance without spreading in both transverse and axial directions, provided they are produced with an infinite aperture and energy. In practice, when the aperture and energy are finite, these beams have a large depth of field. Because of this property, limited diffraction beams have applications in medical imaging, tissue property identification, blood flow velocity vector measurement, nondestructive evaluation (NDE) of materials, communications, and other areas such as optics and electromagnetics.

In this report, we study the intrinsic relationship between X waves and any solutions including limited diffraction solutions to the isotropic-homogeneous scalar wave equation. Results show that any well-behaved solutions to the wave equation can be expressed as a linear superposition of X waves (using X waves as basis functions). The coefficients of the expression can be obtained using the orthogonal property of X waves. These results produce a new transform, called X wave transform. The X wave transform is significant because it reveals the relationship between X waves and any waves including other limited diffraction beams. It can be used to design new limited diffraction beams that may also have practical applications.

FRIDAY, JUNE 4

9. ELASTICITY 2

9.1 **Elastographic imaging of the canine prostate *in-vitro,*** Faouzi Kallel,[1] Elisa Konofagou,[1] Roger E. Price,[2] R. Jason Stafford,[3] Raffaella Righetti,[1] and Jonathan Ophir[1] [1]*University of Texas Medical School, Department of Radiology, Ultrasonics Laboratory, 6431 Fannin St., Houston, TX 77030,* [2]*The University of Texas, M.D. Anderson Cancer Center of Veterinary Medicine and Surgery and* [3]*Section of Diagnostic Imaging Physics, 1515 Holcombe Blvd., Houston, TX 77030.*

Ten freshly excised canine prostates were mounted inside of a homogeneous block of gel for support during elastographic imaging. Parallel equally-spaced cross-sectional elastograms were obtained at 5 MHz as well as matching sonograms. After data acquisition, the

6/2/99

Jian-yu Lu

PROGRAM AND ABSTRACTS

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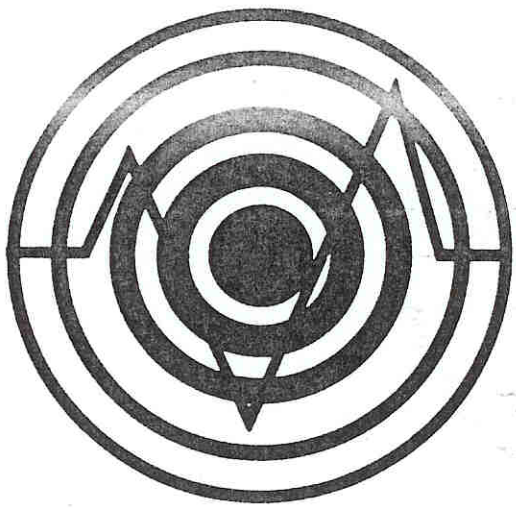

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