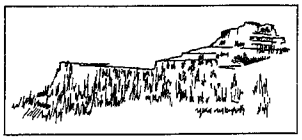
Apt



CNSS
Center for National Security Studies
Los Alamos National Laboratory

November 27, 1989

CNSS-J:89-252

Professor Matthew Meselson
Department of Biochemistry and Molecular Biology
Harvard University
Cambridge, MA 02138

Dear Professor Meselson:

It was a pleasure meeting you during the recent AAAS meeting in Washington. I found the CW panel presentation by you and Sheila Buckley to be both informative and well balanced. As promised, I have enclosed some material on the resonant ultrasound spectroscopy (RUS) technique pioneered here at Los Alamos by Al Migliori and colleagues. (Unfortunately, time did not permit discussion of this technique during your recent visit to Los Alamos.)

RUS, like several other nondestructive methods, may have applicability in verification of declared stockpiles of CW. RUS can be used to determine the intrinsic acoustic impedance, velocity, and attenuation of an object under investigation. By measuring these parameters, one could obtain a relatively "unique" signature of an object and its condensed-phase contents. In its simplest form, RUS might be useful in determining dissimilarities in a group of objects, e.g., CW munitions or bombs. Thus, one could consider monitoring stockpile groups, or strata, by the nondestructive determination of the *homogeneity* of the items of the strata. An item dissimilar to others in its stratum could elicit further measurement by more definitive means. This approach would enable one to address diversion scenarios involving the substitution of "dummy" munitions or materials in stockpiles.

Additionally, the RUS technique could be useful in distinguishing between conventional munitions and those containing CW, since both the internal configuration and the contents are different for these two types of munitions even though they might have the same outward specifications. The question of determining the exact contents (e.g., VX versus GB versus simulant) of a CW munition, bomb, or storage container using RUS is, of course, problematical. Even more difficult, but commensurately more interesting, is the use of RUS in conjunction with laser spectroscopy for possible remote sensing applications.

Having made these statements about the potential applicability of RUS, let me make clear that these are my personal musings on the subject; they do not necessarily represent thinking by the DOE or other official organizations. Additionally, it is important to underscore that the RUS technique is at this point unproven in the field of CW verification. Many studies would have to be conducted before the U.S. Government might have confidence in the technique as a verification measure.

Additionally, RUS would likely be most appropriate as one of a suite of nondestructive techniques (along with nuclear based interrogation and field x-radiography) that could be employed in an increasing hierarchy of measurements, depending upon the degree of certainty required in verifying the stratum of CW.

In addition to the RUS literature, I have enclosed a copy of a recent address I gave to the International Studies Association. Please keep me on your distribution list for CW-related communications and I will do likewise. Again, it was a pleasure meeting you at long last, and I trust we shall meet again.

Sincerely,

Kenneth E. Apt, Ph.D.

Enclosures a/s

cy: CRM-4/A150 w/o encl.
A. Migliori, P-10/K764, w/o encl.
D. Sinha, MEE-11/D429, w/o encl.
J. Shipley, SST-VP/D460, w/o encl.
J. Hopkins, ADAL/A112, w/o encl.
CNSS File