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Form Approved
OMB No 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	March 1992	Final 15 Dec 88-14 Dec 91

4. TITLE AND SUBTITLE

Micromechanics of Defects

5. FUNDING NUMBERS

DAAL03-89-K-0019

6. AUTHOR(S)

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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

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8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

U. S. Army Research Office
P. O. Box 12211
Research Triangle Park, NC 27709-2211

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

ARO 26057.16-EG

11. SUPPLEMENTARY NOTES

The view, opinions and/or findings contained in this report are those of the author(s) and should not be construed as an official Department of the Army position, policy, or decision, unless so designated by other documentation.

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13. ABSTRACT (Maximum 200 words)

This report contains a brief outline of research findings and a list of publications and technical reports related to the project.

14. SUBJECT TERMS

Crack Arrest Mechanism, Composite Materials, Material Defects, Nondestructive Testing, Materials

15. NUMBER OF PAGES

3

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UL

Brief Outlines of Research Findings

A physical explanation was given for the crack arrest mechanism in fiber reinforced composite materials. An award (Sawamura award) was given to this paper as the best paper in a year by Japan Society of Steels and Alloys.

Micromechanics of defects was studied completely in different direction (the inverse problem). This method provides a new approach of NDE (Nondestructive Evaluation) which can predict defects and integrity in materials or structures by knowing surface displacement change or measuring the surface tilts.

The most recent discovery is the following. When sliding occurs on the interface between matrix and inclusions (or inhomogeneities), the stress field $\tau_{ij}(x)$ can be expressed by a linear combination of Eshelby's solution $\sigma_{ij}^{E}(\epsilon^{*})$ and Volterra's solution $\sigma_{ij}^{V}(\mathbf{b})$, *i,e.*,

$$\tau_{ij}(x) = \sigma_{ij}^{E}(\epsilon^{*}) + s\sigma_{ij}^{V}(\mathbf{b}).$$

The factor s represents the degree of relaxation and it can explicitly be determined for the spherical sliding inclusions in terms of material constants.

Publications and technical reports related to this project are listed in a separated sheet. The following post doctor fellows participated in this project :

Dr. T. Mori — Professor, Tokyo Institute of Technology, Japan.

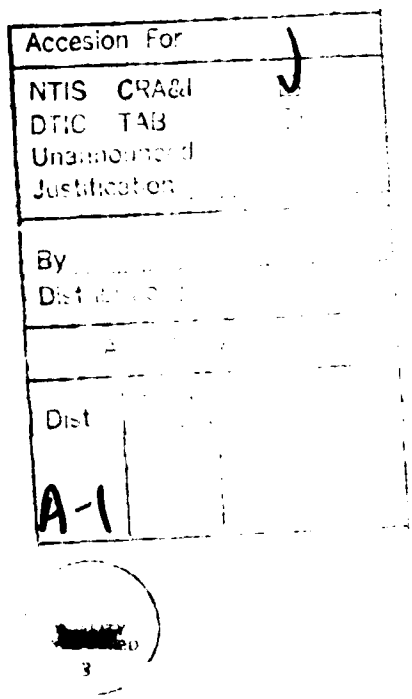
Dr. K. Tanaka — Professor, Nagaoka Institute of Technology, Japan.

Dr. A. Sato — Professor, Tokyo Institute of Technology, Japan.

The following students participated and Ph.D. degree was awarded to them

Demitris Kourris	Assistant Professor, Arizona State University.
Z. Gao	Assistant Professor, Clarkson University, N.Y.
Iwona Jasiuk	Assistant Professor, Michigan State University.

Professor Mura was made a honorary member of the Japan Institute of Metals Society due to his contributions to the field of metallurgy.



Proposal Number 26057-EG
Funding Document DAAL03-89-k-0019

1. Axisymmetrically Loaded Thin Circular Plate in Adhesive Contact with an Elastic Half-Space, by E. N. Mastrojannis *et al.*

2. The Elastic Field of a Hemispherical Inhomogeneity at the Free Surface of an Elastic Half Space, by D. A. Kouris and T. Mura.

3. A Dislocation Model for Hardness Indentation Problems -- I, by T. Mura *et al.*

4. A Dislocation Model for Hardness Indentation Problems -- II, by K. Tanaka *et al.*

5. The Hemispheroidal Inhomogeneity at the Free Surface of an Elastic Half Space, by D. Kouris *et al.*

6. Impotent Dislocation Walls, by T. Mura.

7. Inverse Problem in Plasticity, by T. Mura and Z. Gao.

8. Crack Arrest by Strong Short Fibers in a Composite, by S. Shibata *et al.*

9. Near Threshold Fatigue Curve Based on the Dislocation Shielding Model of Fracture, by S. J. Chang and T. Mura.

10. Octahedral Defects in a b.c.c. Lattice Examined by Lattice Theory, by A. Sato *et al.*

11. Crack Branching Behavior in Stress Corrosion Cracking of High Strength Steel, by Y. Hirose and T. Mura.

12. Nonlinearity of Inverse Problems, by T. Mura and Z. Gao.

13. An Inverse Problem in Elasticity with Overprescribed Boundary Conditions, by Weichung Yeih *et al.*

14. Frictional Sliding Inclusions, by Jin H. Huang *et al.*