

Stanford



Richard Christensen

Professor (Research) of Aeronautics and Astronautics and of Mechanical Engineering,
Emeritus

CONTACT INFORMATION

- **Administrator**

William Webster - Administrative Associate

Email wbw@stanford.edu

Tel (650) 725-2183

Bio

BIO

Professor Christensen's research is concerned with the mechanics of materials. The behavior of polymers and polymeric fiber composites are areas of specialization. Of particular interest is the field of micro-mechanics that focuses on materials' functionality at intermediate-length scales between atomic and the usual macro scale. Applicable techniques involve the methods of homogenization for all types of composite materials. The intended outcomes of his research are useful means of characterizing the yielding, damage accumulation, and failure behavior of modern materials. A related website has been developed to provide critical evaluations for the mathematical failure criteria used with the various classes of engineering materials. Most of these materials types are employed in aerospace structures and products.

ACADEMIC APPOINTMENTS

- Emeritus Faculty, Acad Council, Aeronautics and Astronautics

HONORS AND AWARDS

- Nadai Medal, American Society of Mechanical Engineers (2006)

BOARDS, ADVISORY COMMITTEES, PROFESSIONAL ORGANIZATIONS

- member, National Academy of Engineering (2013 - present)

PROFESSIONAL EDUCATION

- DEng, Yale (1961)

LINKS

- <http://www.FailureCriteria.com>: <http://www.FailureCriteria.com>

Publications

PUBLICATIONS

- **An evaluation of the failure modes transition and the Christensen ductile/brittle failure theory using molecular dynamics** *PROCEEDINGS OF THE ROYAL SOCIETY A-MATHEMATICAL PHYSICAL AND ENGINEERING SCIENCES*
Christensen, R., Li, Z., Gao, H.

2018; 474 (2219)

- **The ductile/brittle transition provides the critical test for materials failure theory** *PROCEEDINGS OF THE ROYAL SOCIETY A-MATHEMATICAL PHYSICAL AND ENGINEERING SCIENCES*

Christensen, R. M.

2018; 474 (2210)

- **Why progress on the failure of fiber composite materials has been so retarded** *JOURNAL OF REINFORCED PLASTICS AND COMPOSITES*

Christensen, R. M.

2017; 36 (22): 1615–17

- **Materials Failure Theory and Applications, Change Is Coming** *JOURNAL OF ENGINEERING MATERIALS AND TECHNOLOGY-TRANSACTIONS OF THE ASME*

Christensen, R. M.

2017; 139 (4)

- **Failure Theory/Failure Criteria for Fiber Composite Laminates** *JOURNAL OF APPLIED MECHANICS-TRANSACTIONS OF THE ASME*

Christensen, R. M., Lonkar, K.

2017; 84 (2)

- **Perspective on Materials Failure Theory and Applications** *JOURNAL OF APPLIED MECHANICS-TRANSACTIONS OF THE ASME*

Christensen, R. M.

2016; 83 (11)

- **The Theoretical Measure of the Ductility of Failure for All Isotropic Materials in All States of Stress** *JOURNAL OF APPLIED MECHANICS-TRANSACTIONS OF THE ASME*

Christensen, R. M.

2016; 83 (6)

- **Evaluation of Ductile/Brittle Failure Theory and Derivation of the Ductile/Brittle Transition Temperature** *JOURNAL OF APPLIED MECHANICS-TRANSACTIONS OF THE ASME*

Christensen, R. M.

2016; 83 (2)

- **A New Theory of Strain Hardening and its Consequences for Yield Stress and Failure Stress** *CMC-COMPUTERS MATERIALS & CONTINUA*

Christensen, R. M.

2015; 47 (1): 45-63

- **The size dependence of tensile strength for brittle isotropic materials and carbon fiber composite materials** *COMPOSITES SCIENCE AND TECHNOLOGY*

Christensen, R., Miyano, Y., Nakada, M.

2015; 106: 9-14

- **The effect on knee-joint load of instruction in analgesic use compared with neuromuscular exercise in patients with knee osteoarthritis: study protocol for a randomized, single-blind, controlled trial (the EXERPHARMA trial)** *TRIALS*

Clausen, B., Holsgaard-Larsen, A., Sondergaard, J., Christensen, R., Andriacchi, T. P., Roos, E. M.

2014; 15

- **Failure Mechanics-Part II: The Central and Decisive Role of Graphene in Defining the Elastic and Failure Properties for all Isotropic Materials** *JOURNAL OF APPLIED MECHANICS-TRANSACTIONS OF THE ASME*

Christensen, R. M.

2014; 81 (11)

- **Failure Mechanics-Part I: The Coordination Between Elasticity Theory and Failure Theory for all Isotropic Materials** *JOURNAL OF APPLIED MECHANICS-TRANSACTIONS OF THE ASME*

Christensen, R. M.

2014; 81 (8)

- **2013 Timoshenko Medal Award Paper-Completion and Closure on Failure Criteria for Unidirectional Fiber Composite Materials** *JOURNAL OF APPLIED MECHANICS-TRANSACTIONS OF THE ASME*

Christensen, R. M.

2014; 81 (1)

- **The World Wide Failure Exercise II Examination of Results** *JOURNAL OF REINFORCED PLASTICS AND COMPOSITES*
Christensen, R. M.
2013; 32 (21): 1668-1672
- **A physically based cumulative damage formalism** *INTERNATIONAL JOURNAL OF FATIGUE*
Christensen, R. M.
2008; 30 (4): 595-602
- **Observations on the definition of yield stress** *ACTA MECHANICA*
Christensen, R. M.
2008; 196 (3-4): 239-244
- **A comparison of open cell and closed cell properties for low-density materials** *JOURNAL OF MECHANICS OF MATERIALS AND STRUCTURES*
Christensen, R. M.
2007; 2 (7): 1299-1307
- **A comprehensive theory of yielding and failure for isotropic materials** *JOURNAL OF ENGINEERING MATERIALS AND TECHNOLOGY-TRANSACTIONS OF THE ASME*
Christensen, R. M.
2007; 129 (2): 173-181
- **Deterministic and probabilistic lifetimes from kinetic crack growth-generalized forms** *INTERNATIONAL JOURNAL OF FRACTURE*
Christensen, R., Miyano, Y.
2007; 143 (1): 35-39
- **A comparative evaluation of three isotropic, two property failure theories** *Symposium on Current Trends in Mechanics*
Christensen, R. M.
ASME.2006: 852-59
- **YIELD FUNCTIONS AND PLASTIC POTENTIALS FOR BCC METALS AND POSSIBLY OTHER MATERIALS** *JOURNAL OF MECHANICS OF MATERIALS AND STRUCTURES*
Christensen, R. M.
2006; 1 (1): 183-200
- **Stress intensity controlled kinetic crack growth and stress history dependent life prediction with statistical variability** *INTERNATIONAL JOURNAL OF FRACTURE*
Christensen, R., Miyano, Y.
2006; 137 (1-4): 77-87
- **Exploration of ductile, brittle failure characteristics through a two-parameter yield/failure criterion** *MATERIALS SCIENCE AND ENGINEERING A-STRUCTURAL MATERIALS PROPERTIES MICROSTRUCTURE AND PROCESSING*
Christensen, R. M.
2005; 394 (1-2): 417-424
- **The three-dimensional analog of the classical two-dimensional truss system** *JOURNAL OF APPLIED MECHANICS-TRANSACTIONS OF THE ASME*
Christensen, R. M.
2004; 71 (2): 285-287
- **A probabilistic treatment of creep rupture behavior for polymers and other materials** *MECHANICS OF TIME-DEPENDENT MATERIALS*
Christensen, R. M.
2004; 8 (1): 1-15
- **A two-property yield, failure (fracture) criterion for homogeneous, isotropic materials** *JOURNAL OF ENGINEERING MATERIALS AND TECHNOLOGY-TRANSACTIONS OF THE ASME*
Christensen, R. M.
2004; 126 (1): 45-52
- **Effective properties for single size, rigid spherical inclusions in an elastic matrix** *COMPOSITES PART B-ENGINEERING*
Christensen, R. M.
2004; 35 (6-8): 475-482

- **Delamination failure investigation for out-of-plane loading in laminates** *JOURNAL OF COMPOSITE MATERIALS*
Christensen, R. M., DeTeresa, S. J.
2004; 38 (24): 2231-2238
- **Failure plane orientations for transverse loading of a unidirectional fiber composite** *14th United States National Congress of Theoretical and Applied Mechanics*
Christensen, R. M., DeTeresa, S. J.
PERGAMON-ELSEVIER SCIENCE LTD.2003: 7055–62
- **Predicting failure in composite laminates using dissipated energy** *JOURNAL OF COMPOSITE MATERIALS*
Huang, H. S., Springer, G. S., Christensen, R. M.
2003; 37 (23): 2073-2099
- **A possible limiting case behavior for brittle material fracture** *JOURNAL OF APPLIED MECHANICS-TRANSACTIONS OF THE ASME*
Christensen, R. M.
2002; 69 (6): 772-774
- **Failure criteria for isotropic materials, applications to low-density types** *INTERNATIONAL JOURNAL OF SOLIDS AND STRUCTURES*
Christensen, R. M., Freeman, D. C., DeTeresa, S. J.
2002; 39 (4): 973-982
- **An evaluation of linear cumulative damage (Miner's Law) using kinetic crack growth theory** *MECHANICS OF TIME-DEPENDENT MATERIALS*
Christensen, R. M.
2002; 6 (4): 363-377
- **Compressive failure of composites using a matrix-controlled failure criterion with the kink band mechanism** *MECHANICS OF MATERIALS*
Christensen, R. M.
2000; 32 (9): 505-509
- **Yield functions, damage states, and intrinsic strength** *MATHEMATICS AND MECHANICS OF SOLIDS*
Christensen, R. M.
2000; 5 (3): 285-300
- **A general measure for the ductility of materials - Part II Applications** *JOURNAL OF MATERIALS SCIENCE LETTERS*
Christensen, R. M.
2000; 19 (16): 1465-1468
- **Basic two-dimensional core types for sandwich structures** *INTERNATIONAL JOURNAL OF MECHANICAL SCIENCES*
Kim, B., Christensen, R. M.
2000; 42 (4): 657-676
- **Mechanics of cellular and other low-density materials** *INTERNATIONAL JOURNAL OF SOLIDS AND STRUCTURES*
Christensen, R. M.
2000; 37 (1-2): 93-104
- **A general measure for the ductility of materials** *JOURNAL OF MATERIALS SCIENCE LETTERS*
Christensen, R. M.
1999; 18 (17): 1371-1373
- **The numbers of elastic properties and failure parameters for fiber composites** *JOURNAL OF ENGINEERING MATERIALS AND TECHNOLOGY-TRANSACTIONS OF THE ASME*
Christensen, R. M.
1998; 120 (2): 110-113
- **Two theoretical elasticity micromechanics models** *JOURNAL OF ELASTICITY*
Christensen, R. M.
1998; 50 (1): 15-25
- **Yield functions failure criteria for isotropic materials** *PROCEEDINGS OF THE ROYAL SOCIETY A-MATHEMATICAL PHYSICAL AND ENGINEERING SCIENCES*

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1997; 453 (1962): 1473-1491

- **The kink band mechanism for the compressive failure of fiber composite materials** *JOURNAL OF APPLIED MECHANICS-TRANSACTIONS OF THE ASME*

Christensen, R. M., DeTeresa, S. J.

1997; 64 (1): 1-6

- **Stress based yield/failure criteria for fiber composites** *INTERNATIONAL JOURNAL OF SOLIDS AND STRUCTURES*

Christensen, R. M.

1997; 34 (5): 529-543

- **On the relationship of minimal conditions to low density material microstructures** *JOURNAL OF THE MECHANICS AND PHYSICS OF SOLIDS*

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