Professor Hans Obrecht

See:
http://www.meinprof.de/uni/prof/38806
http://www.springerlink.com/content/xjn18u772917x123/

Fakultät Architektur und Bauingenieurwesen
Lehrstuhl Mechanik Statik Dynamik
Technische Universität Dortmund

Selected Publications:

From shellbuckling.com/bibliography:
Section 2: List of mainly books on plates and shells compiled by Hans Obrecht in 2001

W. Wunderlich, H.J. Rensch and H. Obrecht, Analysis of elastic-plastic buckling and imperfection-sensitivity of shells of revolution. In: E. Ramm, Editor, Buckling of shells: Proceedings of a State-of-the-Art ColloquiumUniversity of Stuttgart, Germany, , Springer-Verlag, Berlin (1982), pp. 137–174.

W. Wunderlich (1), Z. Lu (1) and H. Obrecht (2)
(1) Lehrstuhl für Statik, Technische Universität München, Arcisstrasse 21, 80333 München, Germany
(2) Lehrstuhl für Baumechanik-Statik, Universität Dortmund
“Elastic and inelastic buckling of ring-stiffened circular cylindrical shells subjected to external pressure”, in

Buckling of shell structures, on land, in the sea, and in the air, edited by J. F. Jullien, Spon Press, 1991, ISBN 1-85166-716-4
ABSTRACT: The paper deals with the results of systematic numerical studies on the nonlinear load-carrying and buckling behavior of ring-stiffened circular cylindrical shells under external pressure. In particular it focuses attention on the conditions under which stiffeners with rectangular cross-sections lead to either global or local (interstiffener) buckling and on the influence of elastic-plastic material behavior. The numerical results are presented in the form of nondimensional diagrams in which the buckling loads of stiffened shells are given directly as functions of a global stiffening parameter containing all relevant information on both the shell's geometry and the type and arrangement of the stiffeners. They indicate the buckling mode as well as the amount by which the load-carrying capacity of a stiffened shell is larger than that of the corresponding unstiffened one. This makes them particularly useful for practical design purposes.

Z. Lu, H. Obrecht and W. Wunderlich, Imperfection Sensitivity of Elastic and Elastic- Plastic Torispherical Pressure Vessel Heads, Buckling Strength of Imperfection- Sensitive Shells, Proc. Euromech Colloquium 317, G.D. Galletly (ed.), Liverpool, 21- 23 (1994).

W. Wunderlich, F. Schnabel and H. Obrecht, Tragfähigkeit zusammengesetzter Rotationsschalen im geometrisch und physikalisch nichtlinearen Bereich (Geometrically and physically nonlinear load-carrying behaviour of shells of revolution), Technisch- Wissenschaftliche Mitteilung 86-3, Institut für Konstruktiven Ingenieurbau, Ruhr-Universität Bochum (1986).

W. Wunderlich, H. Obrecht, H. Springer and Z. Lu, A semi-analytical approach to the nonlinear analysis of shells of revolution, Analytical and Computational Models for Shells, Noor, A. K., Belytschko, T. & Simo, J. C., eds., ASME, New York, N. Y., 3, 509-36 (1989).

Hans Obrecht (Division of Engineering and Applied Physics, Harvard University, Cambridge, MA 02138, U.S.A.), "Creep buckling and postbuckling of circular cylindrical shells under axial compression", International Journal of Solids and Structures, Vol. 13, No. 4, 1977, pp. 337-355, doi:10.1016/0020-7683(77)90018-X
ABSTRACT: An infinitely long, axially compressed, circular cylindrical shell with an imperfection in the shape of the axisymmetric classical buckling mode, undergoing steady or non-steady creep, is analyzed. The axisymmetric problem is solved incrementally using nonlinear shell equations The ratio of the applied stress to the classical buckling stress determines if the shell will collapse axisymmetrically or if it will bifurcate into a nonaxisymmetric mode, and whether or not bifurcation will result in instantaneous collapse. The bifurcation problem is formulated exactly and the initial postbuckling behavior is investigated via an asymptotic elastic analysis, based on Koiter's general theory Numerical results are compared with available experimental data.

W. Wunderlich, H. Cramer and H. Obrecht (Institut für Konstruktiven Ingenieurbau, Lehrstuhl IV, Ruhr-Universität Bochum, Germany), "Application of ring elements in the nonlinear analysis of shells of revolution under nonaxisymmetric loading", Computer Methods in Applied Mechanics and Engineering, Vol. 51, Nos. 1-3, September 1985, pp. 259-275, doi:10.1016/0045-7825(85)90036-2
ABSTRACT: A problem-oriented method for the nonlinear elastic-plastic analysis of nonsymmetrically loaded shells of revolution is described. It is based on an approximation of the circumferential distribution of the loads and variables by Fourier series. Ring finite elements are used in the axial direction. Their stiffness matrices are obtained by accurate numerical integration rather than by trial functions. To be able to take full advantage of the Fourier decomposition and the one-dimensional discretization, all nonlinearities are treated iteratively in the form of pseudo-load vectors. Thus, the various Fourier harmonics are governed by uncoupled algebraic

equations and no explicit knowledge of the nonlinear global tangent stiffness matrix is required. Convergence problems of the iterative procedure are avoided by employing a sort of conjugate gradient method with a special preconditioning within each increment. Numerical examples involving strongly nonlinear behavior and highly nonsymmetric states of stress and deformation are given which demonstrate the effectiveness of the method.

H. Obrecht, W. Goebel and W. Wunderlich, "Nonlinear dynamic analysis of shells of revolution" (Refined dynamical theories of beams, plates and shells and their applications), Proceedings of the 219th Euromech Colloquium, Kassel, Federal Republic of Germany; 23-26 Sept. 1986. pp. 402-419. 1987
ABSTRACT: This paper addresses the nonlinear dynamic analysis of shells of revolution. Starting from a discretization procedure which is tailored to the particular geometry of these shells, a direct time integration procedure is discussed. It employs the Newmark temporal operator, and a modified preconditioned conjugate-direction method is used to solve the resulting algebraic equations. Subsequently, a closely related reduced basis technique is presented which combines some of the features of the direct integration procedure with those of the standard reduction methods.

Wunderlich, W., Obrecht, H. and Schrödter, V. (Institut für Konstruktiven Ingenieurbau, Ruhr-Universität Bochum, Bochum, W. Germany), "Nonlinear analysis and elastic–plastic load-carrying behaviour of thin-walled spatial beam structures with warping constraints", International Journal for Numerical Methods in Engineering, Vol. 22: 1986, pp. 671–695. doi: 10.1002/nme.1620220311
ABSTRACT: An analysis of the elastic–plastic load-carrying behaviour of thin-walled spatial beam structures is presented. It is based on a beam theory valid for large displacements and rotations, which admits arbitrary cross-sections, curved axes, initial imperfections, a general material description, and which fully accounts for the influence of warping constraints as well as the stress-history dependence of the elastic–plastic shear moduli. An incremental updated Lagrangian viewpoint is adopted in the derivation of the basic beam equations from a generalized variational principle, and in the numerical solution procedure the displacement–finite element approach is followed. The associated tangential stiffness matrices are obtained by direct numerical integration of the governing incremental differential equations rather than through the use of shape functions in connection with a virtual work principle. Applications of the theory are given in which the influence of the loading configuration, material parameters, geometric nonlinearities and warping constraints on the load-carrying behaviour and on the bifurcation and ultimate loads of thin-walled beam structures is explored.

Z. Lu, H. Obrecht and W. Wunderlich
Lehrstuhl für Baumechanik-Statik, Universitat Dortmund, Germany
Lehrstuhl für Statik, Technische Universitat München, Germany
"Imperfection sensitivity of elastic and elastic-plastic torispherical pressure vessel heads", Thin-Walled Structures, Vol. 23, Nos. 1-4, 1995, pp. 21-39, Special Issue: Buckling Strength of Imperfection-sensitive Shells, doi:10.1016/0263-8231(95)94359-2
ABSTRACT: The paper deals with the results of a systematic numerical investigation of the nonlinear elastic and elastic plastic load-carrying behaviour and imperfection sensitivity of torispherical pressure vessel heads under uniform external pressure. In particular, the presentation focuses on the qualitative and quantitative influence of the radius-to-thickness ratio R/t, the yield stress sigma0 and the magnitude of initial geometric imperfections (in the shape of the elastic bifurcation mode) on the elastic-plastic load-carrying behaviour. It is found that thinner shells are more sensitive to the value of the yield stress and the magnitude of initial geometric imperfections, but their load-carrying capacity, relative to the elastic bifurcation pressure, may also be significantly higher than that of thicker shells.

H. Obrecht, B. Rosenthal, P. Fuchs (Baumechanik-Statik, Universitaet Dortmund, D-44221 Dortmund, Germany), "Buckling And Imperfection-Sensitivity Of Axially Compressed Cylindrical Shells With Compliant Cores", (no date or publisher given, latest reference is 200l, fluid.ippt.gov.pl)
ABSTRACT: The extent to which the mechanical properties and dimensions of compliant cores influence the load-carrying capacity and imperfection-sensitivity of axially compressed cylindrical shells is analyzed numerically for a wide range of configuration parameters. It is found that a comparatively thin layer of core material is sufficient to achieve substantial increases in the buckling loads while at the same time the imperfection-sensitivity is significantly smaller than for the unfilled shell.

H. Obrecht, B. Rosenthal, P. Fuchs, S. Lange and C. Marusczyk (Universität Dortmund, Germany), "Buckling, postbuckling and imperfection-sensitivity: Old questions and some new answers", Computational Mechanics, Vol. 37, No. 6, 2006, pp. 498-506, doi: 10.1007/s00466-005-0732-z
ABSTRACT: From the point-of-view of economy and safety it is desirable to employ structural configurations with a favorable strength-to-weight ratio and a sufficiently small imperfection-sensitivity. The presentation focuses on two examples falling into this category: The axially compressed cylindrical shell filled with – and/or surrounded by - a compliant core, and auxetic structures. Both exhibit unexpected aspects in their load-carrying behavior and have a significant weight-savings potential.

H. Obrecht, P. Fuchs, U. Reinicke, B. Rosenthal and M. Walkowiak (Lehrstuhl für Baumechanik-Statik, Technische Universität Dortmund, August-Schmidt-Strasse 6, D-44221 Dortmund, Germany), "Influence of wall constructions on the load-carrying capability of light-weight structures" (Dedicated to Professor Choon Fong Shih, President of the National University of Singapore on the occasion of this 60th birthday.), International Journal of Solids and Structures, Vol. 45, No. 6, March 2008, pp. 1513-1535, doi:10.1016/j.ijsolstr.2007.10.017
ABSTRACT: Results of systematic numerical studies are presented which suggest that suitable alternative wall constructions may lead to elastic load-carrying capacities of light-weight structures which significantly exceed those of conventional monocoque constructions, and that in certain cases this improvement may also be accompanied by a decrease in imperfection-sensitivity. Two kinds of wall modifications are considered: a hybrid wall construction where the skin of a light-weight structure is coated with a low-density material, and nonhomogeneous – in particular lattice and biaxially corrugated – wall constructions. The paper focuses on the elastic load-carrying behavior of shell- and plate-like structures, and structural efficiency is assessed on the basis of their bifurcation buckling resistance while other design criteria, such as e.g. stiffness and plasticity, are not taken into account.