Publications of the NASA CELSS (Controlled Ecological Life Support Systems) Program

Patricia A. Dufour, Judy L. Solberg, and Janice S. Wallace

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(Controlled Ecological Life Support Systems) Program

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and Janice S. Wallace

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Foreword

The CELSS (Controlled Ecological Life Support Systems) Program, within the Office of Space Science and Applications of the National Aeronautics and Space Administration (NASA), was established in 1979. The purpose of this program is to investigate the bioregeneration of food, water, and oxygen, with recycling of all wastes produced in the system, in order to maintain humans on long-term space missions independent of the need for resupply from Earth. Research supported by this program is divided into the following broad areas: 1) human requirements; 2) food production; 3) waste management; and 4) system management and control.

The arrangement of references in this bibliography follows the four divisions of research described above. Articles are listed alphabetically by author under the research area with which they are associated. Publications from 1979 to 1985, which are the result of research supported by the CELSS Program, have been included. Some references published prior to 1979 that involve background research for the development of the CELSS Program have also been included. This listing is not complete; it only includes references identified and entered into the Life Sciences Bibliography Data Base of The George Washington University as of May 1985. The majority of 1985 references identified during the preparation of this report were in press and will be included in the next CELSS bibliography.

Our intent in compiling this bibliography is twofold. First, we would like to provide the scientific community with a list of current publications resulting from research pursued under the auspices of NASA's CELSS Program. Secondly, we hope to stimulate the exchange of information and ideas among scientists working in the different areas of the program. We have identified for each publication, by asterisk, the author (principal investigator) participating in the program.

We wish to acknowledge the assistance of James H. Bredt for overall direction, of April Commodore Roy for data entry, and of the CELSS principal investigators for furnishing their reprints.
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I. Human Requirements

COCHRAN, H.D.; DONNELLY, R.G.; MODELL*, M.; BADDOUR, R.F.
THE CARBON MONOXIDE OXIDATION ON A PLATINUM CATALYST.
IN: COLLOID AND INTERFACE SCIENCE, VOL. III: ADSORPTION,
CATALYSIS, SOLID SURFACES, WETTING, SURFACE TENSION, AND
WATER. (KERKER, M., ED.)
NEW YORK: ACADEMIC, P. 131-142, 1976
(GWU 4403)

FLAMM, D.L.; WYDEVEN*, T.J.
FURTHER DEVELOPMENTS IN OXIDATION OF METHANE TRACES WITH
RADIO-FREQUENCY DISCHARGE.
ENVIRONMENTAL SCIENCE & TECHNOLOGY
11: 514-516, 1977. (GWU 2054)

FLAMM, D.L.; WYDEVEN*, T.J.
OXIDATION OF CONTAMINATIVE METHANE TRACES WITH
RADIO-FREQUENCY DISCHARGE
ENVIRONMENTAL SCIENCE & TECHNOLOGY
10: 591-595, 1976. (GWU 2055)

FLAMM, D.L.; WYDEVEN*, T.J.
ELECTRIC DISCHARGE FOR TREATMENT OF TRACE CONTAMINANTS.
PATENT.
US-PATENT-4, 130, 490
9 P., DEC 19, 1978. (GWU 3124)

GLASER, P.E.; MABEL*, J.A.
NUTRITION AND FOOD TECHNOLOGY FOR A CONTROLLED ECOLOGICAL
LIFE SUPPORT SYSTEM (CELSS).
ARTHUR D. LITTLE, INC., CAMBRIDGE, MA, MAY 1981. (GWU 1202)

KAREL*, M.; VILLOTA, R.
ENGINEERED FOODS IN PCELSS: AN ANALYSIS.
(GWU 1722)

KAREL*, M.
FOOD TECHNOLOGY IN SPACE HABITATS.
PAPER PRESENTED AT THE 9TH INTERSOCIETY CONFERENCE ON
ENVIRONMENTAL SYSTEMS, SAN FRANCISCO, CALIFORNIA, JULY 16-19,
1979, 5 P. (ASME PUBL. 79-ENAS-31) (GWU 1198)
KAREL*, M.
EVALUATION OF ENGINEERED FOODS FOR CLOSED ECOLOGICAL LIFE SUPPORT SYSTEM (CELSS) - INTERIM REPORT, 1 DEC. 1979 TO 31 JAN.
1981.
(GWU 1723)

KAREL*, M.
PROBLEMS OF FOOD TECHNOLOGY IN SPACE HABITATS.

KAREL*, M.
FOOD SYSTEMS FOR PCELSS.
IN: CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM: FIRST PRINCIPAL INVESTIGATORS MEETING (MOORE, B.; WHARTON, R.A.; MacELROY, R.D., EDS.)
NASA, WASHINGTON, D.C., P. 34-37, 1982.
(NASA-CP-2247) (GWU 3959)

KAREL*, M.
EVALUATION OF ENGINEERING FOODS FOR CLOSED ECOLOGICAL LIFE SUPPORT SYSTEM (CELSS) - FINAL REPORT.

KAREL*, M.; VILLOTA, S.R.; HEIDELBAUGH, H.D.D.
MAXIMIZING STORAGE STABILITY OF FOODS TO BE USED FOR RESUPPLY IN A CONTROLLED ECOLOGICAL LIFE SUPPLY SYSTEM: EVALUATION OF RESEARCH.
(GWU 1725)

KAREL*, M.
EVALUATION OF ENGINEERING FOODS FOR CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEMS (CELSS).

KLICKA, M.V.; SMITH*, M.C.
FOOD FOR US MANNED SPACE FLIGHT.

LUH, N.; FLINK, J.M.; KAREL*, M.
FABRICATION, CHARACTERIZATION, AND MODIFICATION OF THE TEXTURE OF CALCIUM ALGINATE GELS.
JOURNAL OF FOOD SCIENCE 42: 976-981, 1977. (GWU 2051)
SMITH*, M.C.
CELSS HUMAN REQUIREMENTS (ABSTRACT).
IN: SPACE-ENVIRONMENT WORKSHOP FOR LIFE SCIENTISTS.

VILLOTA, R.; SAGUY, L.; KAREL*, M.
STORAGE STABILITY OF DEHYDRATED FOOD: EVALUATION OF
LITERATURE DATA.
JOURNAL OF FOOD QUALITY

VILLOTA, R.; SAGUY, I.; KAREL*, M.
AN EQUATION CORRELATING SHELF LIFE OF DEHYDRATED VEGETABLE
PRODUCTS WITH STORAGE CONDITIONS.
JOURNAL OF FOOD SCIENCE
45: 398-399, 401, 1980. (GWU 1201)

WEISS, U.; FUNES, J.; KAREL*, M.
POLYMERIZATION OF PROTEIN WITHIN OXIDIZING LECITHIN VESICLES
(ABSTRACT).
ABSTRACTS OF PAPERS, AMERICAN CHEMICAL SOCIETY
182(AUG): AGFD-31, 1981. (GWU 4481)

WYDEVEN* T.J.
RECOMMENDATIONS OF THE PANELS: PANEL ON OZONE DESTRUCTION
TECHNIQUES.
IN: OZONE CONTAMINATION IN AIRCRAFT CABINS.
(GWU 3351)
II. Food Production

ASLAM, M.; HUFFAKER*, R.C.  
EFFECT OF SUGARS ON IN VIVO NITRATE REDUCTION IN BARLEY LEAVES IN LIGHT AND DARKNESS UNDER AEROBIC CONDITIONS (ABSTRACT).  
PLANT PHYSIOLOGY  
72(1, SUPPL.): 129, 1983. (GWU 4487)

ASLAM, M.; HUFFAKER*, R.  
EFFECTS OF VARIOUS FORMS OF NITROGEN NUTRITION ON THE DEVELOPMENT OF NITRATE AND NITRITE REDUCTASE ACTIVITIES IN GLYCINE MAX (L.) MERR (ABSTRACT).  
PLANT PHYSIOLOGY  
75(1, SUPPL.): 119, 1984. (GWU 5756)

EARLY EFFECTS OF SALINITY ON NITRATE AND AMMONIUM ASSIMILATION IN BARLEY SEEDLINGS (ABSTRACT).  
PLANT PHYSIOLOGY  
75(1, SUPPL.): 65, 1984. (GWU 5827)

BARTA, D.J.  
CHARACTERISTICS OF HIGH INTENSITY DISCHARGE LAMPS (ABSTRACT).  
HORTSCIENCE  
17(3): 493, 1982. (GWU 6270)

BARTA, D.J.; TIBBITTS*, T.W.  
ENCLOSURE OF YOUNG LETTUCE LEAVES: EFFECTS ON TIPBURN INCIDENCE AND LEAF CALCIUM AND MAGNESIUM CONCENTRATION (ABSTRACT).  
HORTSCIENCE  
19(3): 582, 1984. (GWU 6268)

BROOKS, C.A.; MITCHELL*, C.A.  
SHAM STIMULATED DARK GERMINATION OF WALDMANN'S GREEN LETTUCE (ABSTRACT).  
PLANT PHYSIOLOGY  
75(1, SUPPL.): 69, 1984. (GWU 5830)

BUBENHEIM, D.L.; BUGBEE, B.; SALISBURY*, F.B.  
EFFECT OF WATER FILTERS ON RADIATION IN CONTROLLED ENVIRONMENTS (ABSTRACT).  
HORTSCIENCE  

BUGBEE, B.; GUERRA, D.; SALISBURY*, F.B.  
A SIMPLE, EFFECTIVE MODIFICATION FOR INCREASING RADIATION IN CONTROLLED ENVIRONMENTS (ABSTRACT).  
HORTSCIENCE  
18(4): 574, 1983. (GWU 6262)
BUGBEE, B.; SALISBURY*, F.B.
EVALUATION OF PH BUFFERING AGENTS FOR NUTRIENT SOLUTION STUDIES (ABSTRACT).
PLANT PHYSIOLOGY
72(1, SUPPL.): 5, 1983. (GWU 4473)

BUGBEE, B.; SALISBURY*, F.B.
IRON NUTRITION OF WHEAT IN SOLUTION CULTURE (ABSTRACT).
HORTSCIENCE
17: 86, 1982. (GWU 4761)

CAMPBELL*, W.F.
INTERACTIVE EFFECTS OF TEMPERATURE AND HUMIDITY ON ONION POLLEN GERMINATION AND POLLEN TUBE GROWTH (ABSTRACT).
HORTSCIENCE
17(1): 26, 1982. (GWU 5210)

CAMPBELL*, W.F.; WAGENET, R.J.; RODRIGUEZ, R.R.
FERTILITY, SALINITY AND WATER MANAGEMENT INTERACTIONS ON YIELD COMPONENTS AND NITROGEN FIXATION IN PHASEOLUS L. (ABSTRACT).
HORTSCIENCE
17: 479, 1982. (GWU 4762)

COLLIER, G.F.; TIBBITTS*, T.W.
EFFECTS OF RELATIVE HUMIDITY AND ROOT TEMPERATURE ON CALCIUM CONCENTRATION AND TIPBURN DEVELOPMENT IN LETTUCE.
JOURNAL OF THE AMERICAN SOCIETY FOR HORTICULTURAL SOCIETY

COLLIER, G.F.; TIBBITTS*, T.W.
TIPBURN OF LETTUCE.
HORTICULTURAL REVIEWS
4: 49-65, 1982. (GWU 6269)

DUFOUR, P.A.
INSECTS: A NUTRITIONAL ALTERNATIVE.

DUFOUR, P.A.
BIBLIOGRAPHY ON CARBOHYDRATE SYNTHESIS. SELECTED WORKS, 1861-1981.

DUFOUR, P.A.
NUTRITIONAL MODELS FOR SPACE TRAVEL FROM CHEMICALLY DEFINED DIETS.
FONG*, F.; FUNKHOUSER, E.A.
AIR POLLUTANT PRODUCTION BY ALGAL CELL CULTURES.

FONG*, F.; FUNKHOUSER, E.A.
AIR POLLUTANT PRODUCTION BY ALGAL CELL CULTURES.

FORD, T.L.; MITCHELL*, C.A.

MAJOR GENE CONTROL OF NITRATE-REDUCTASE ACTIVITY IN COMMON WHEAT. CROP SCIENCE 20: 717-721, 1980. (GWU 3098)

GOYAL, S.S.; HUFFAKER*, R.C.; LORENZ, O.A.
INHIBITORY EFFECTS OF AMMONIACAL NITROGEN ON GROWTH OF RADISH PLANTS. II. INVESTIGATION ON THE POSSIBLE CAUSES OF AMMONIUM TOXICITY TO RADISH PLANTS AND ITS REVERSAL BY NITRATE. JOURNAL OF THE AMERICAN SOCIETY FOR HORTICULTURE SCIENCE 107: 130-135, 1982. (GWU 5020)

GOYAL, S.S.; HUFFAKER*, R.C.
INTERACTIONS AMONG NITRATE, NITRITE AND AMMONIUM DURING ASSIMILATION IN DETACHED BARLEY LEAVES (ABSTRACT). PLANT PHYSIOLOGY 65(6, SUPPL.): 16, 1980. (GWU 3897)

GOYAL, S.S.; HUFFAKER*, R.C.
INTERACTIVE EFFECTS OF NO₃⁻, NO₂⁻ AND NH₄⁺ ON EACH OTHER'S UPTAKE AND ASSIMILATION IN INTACT WHEAT SEEDLINGS (ABSTRACT). PLANT PHYSIOLOGY 72(1, SUPPL.): 110, 1983. (GWU 4490)

GOYAL, S.S.; HUFFAKER*, R.C.
INDUCTION AND KINETICS OF NO₃⁻, NO₂⁻, AND NH₄⁺ UPTAKE SYSTEMS IN WHEAT (TRITICUM AESTIVUM L.) (ABSTRACT). PLANT PHYSIOLOGY 75(1, SUPPL.): 11, 1984. (GWU 5823)
GOYAL, S.S.; LORENZ, O.A.; HUFFAKER*, R.C.
INHIBITORY EFFECTS OF AMMONIACAL NITROGEN ON GROWTH OF RADISH PLANTS. I. CHARACTERIZATION OF TOXIC EFFECTS OF NH₄⁺ ON GROWTH AND ITS ALLEVIATION BY NO₃⁻.

GUERRA, D.; SALISBURY*, F.B.
EFFECTS OF LONG TERM EXPOSURE OF WHEAT TO DIVERSE SPECTRAL ENVIRONMENTS: IN VIVO CONTROL MECHANISM OF THE PHENYLPROPANOID PATHWAY (ABSTRACT).
PLANT PHYSIOLOGY 72(1, SUPPL.): 163, 1983. (GWU 4472)

GUPTA, A.S.; HUFFAKER*, R.C.; RAINS, D.W.
THE EFFECTS OF SALT STRESS ON NITROGEN UPTAKE AND METABOLISM IN BARLEY (ABSTRACT).
PLANT PHYSIOLOGY 72(1, SUPPL.): 135, 1983. (GWU 4492)

HEATH-PAGLIUSO, S.; HUFFAKER*, R.C.; ALLARD, R.W.
INHERITANCE OF NITRITE REDUCTASE AND REGULATION OF NITRATE REDUCTASE, NITRITE REDUCTASE, AND GLUTAMINE SYNTHETASE ISOZYMES.
PLANT PHYSIOLOGY 76: 353-358, 1984. (GWU 6078)

HOFF*, J.E.; HOWE*, J.M.; MITCHELL*, C.A.
NUTRITIONAL AND CULTURAL ASPECTS OF PLANT SPECIES SELECTION FOR A CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM.
MOFFETT FIELD, CA: NASA, AMES RESEARCH CENTER, 125 P., MARCH 1982. (GWU 2788)

HOFF*, J.E.; HOWE*, J.M.; MITCHELL*, C.A.
DEVELOPMENT OF SELECTION CRITERIA AND THEIR APPLICATION IN EVALUATION OF CELSS CANDIDATE SPECIES.
IN: CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM: FIRST PRINCIPAL INVESTIGATORS MEETING (MOORE, B.; WHARTON, R.A., MacELROY, R.D., EDs.).

HOWE*, J.M.; HOFF*, J.E.
PLANT DIVERSITY TO SUPPORT HUMANS IN A CELSS GROUND-BASED DEMONSTRATOR.
HOWE*, J.M.; HOFF*, J.E.
PLANT DIVERSITY TO SUPPORT HUMANS IN A CELSS GROUND-BASED
DEMONSTRATOR: FINAL REPORT, COVERING THE PERIOD JULY 1,
1979 - OCTOBER 1, 1981.
PURDUE UNIVERSITY, WEST LAFAYETTE, IN, 49 P., OCTOBER, 1981.
(NASA-CR-168918) (GWU 4711)

HUFFAKER*, R.C.
BIOCHEMISTRY AND PHYSIOLOGY OF LEAF PROTEINS.
IN: NUCLEIC ACIDS AND PROTEINS IN PLANTS: I STRUCTURE,
BIOCHEMISTRY AND PHYSIOLOGY OF PROTEINS (BOULTER, D.;
PARTHIER, B., EDS.).
NEW YORK: SPRINGER-VERLAG, P. 370-400, 1982. (ENCYCLOPEDIA OF
PLANT PHYSIOLOGY, NEW SERIES, VOL. 14A) (GWU 3993)

HUFFAKER*, R.C.
SELECTION OF CROP VARIETIES FOR EFFICIENT PRODUCTION USING
UREA, AMMONIA, NITRITE, AND NITRATE IN CELSS.
IN: CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM: FIRST
PRINCIPAL INVESTIGATORS MEETING (MOORE, B.; WHARTON, R.A.;
MacELROY, R.D., EDS.).
(NASA-CP-2247) (GWU 4024)

HUFFAKER*, R.C.; MILLER, B.L.
REUTILIZATION OF RIBULOSE BISPHOSPHATE CARBOXYLASE.
IN: PHOTOSYNTHETIC CARBON ASSIMILATION (SIEGELMAN, H.W.;
HIND, G., EDS.).
NEW YORK: PLENUM, P. 139-152, 1979. (GWU 3832)

HUFFAKER*, R.C.; RAINE, D.W.; QUALSET, C.O.
UTILIZATION OF UREA, AMMONIA, NITRITE, AND NITRATE BY CROP
PLANTS IN A CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM
(CELSS).
(NASA-CR-166417) (GWU 3721)

JOSHI*, J.
QUANTITATIVE ANALYSIS OF BIOMASS PRODUCTION AND COMPATIBILITY
STUDIES OF EARLY MATURING SOYBEAN CULTIVARS FOR GBCD.
IN: GUIDING THE DEVELOPMENT OF A CONTROLLED ECOLOGICAL LIFE
SUPPORT SYSTEM. (MASON, R.M., CARDEN, J.L., EDS.).
ATLANTA, GA: METRICS, INC., P. 71-72, 1979. (GWU 3265)

KAREL*, M.
UTILIZATION OF NON-CONVENTIONAL SYSTEMS FOR CONVERSION OF
BIOMASS TO FOOD COMPONENTS: POTENTIAL FOR UTILIZATION OF
ALGAE IN ENGINEERED FOODS. ANNUAL REPORT TO NASA CELSS
PROGRAM UNDER NCC 2-231.
MASSACHUSETTS INSTITUTE OF TECHNOLOGY, CAMBRIDGE, MA, 23 P.,
MARCH 1985.
KAREL*, M.; KAMAREI, A.R.; MacELROY*, R.D.
FEASIBILITY OF PRODUCING A RANGE OF FOOD PRODUCTS FROM A LIMITED RANGE OF UNDIFFERENTIATED MAJOR FOOD COMPONENTS.

KNIGHT, S.L.; MITCHELL*, C.A.
STIMULATION OF LETTUCE PRODUCTIVITY BY VARIOUS COMBINATIONS OF LIGHT, TEMPERATURE, AND NITROGEN NUTRITION (ABSTRACT).
HORTSCIENCE
17: 477, 1982. (GWU 3430)

KNIGHT, S.L.; MITCHELL*, C.A.
GROWTH ENHANCEMENT OF 'WALDMANN'S GREEN' LEAF LETTUCE BY CO\textsubscript{2} ENRICHMENT, PAR ELEVATION, AND/OR PGR'S (ABSTRACT).
PLANT PHYSIOLOGY
75(1, SUPPL.): 191, 1984. (GWU 5821)

KNIGHT, S.L.; MITCHELL*, C.A.
ENHANCEMENT OF LETTUCE YIELD BY MANIPULATION OF LIGHT AND NITROGEN NUTRITION.
JOURNAL OF THE AMERICAN SOCIETY OF HORTICULTURE SCIENCE

KNIGHT, S.L.; MITCHELL*, C.A.
STIMULATION OF LETTUCE PRODUCTIVITY BY MANIPULATION OF DIURNAL TEMPERATURE AND LIGHT.
HORTSCIENCE

KNIGHT, S.L.; MITCHELL*, C.A.
EFFECTS OF ELEVATED CO\textsubscript{2} AND OR PAR ON GROWTH KINETICS OF 'WALDMANN'S GREEN' LEAF LETTUCE.
HORTSCIENCE

KOBRINGER, J.M.; TIBBITTS*, T.W.
DIURNAL RESPONSE OF PEAS TO MIXTURES OF SO\textsubscript{2} AND O\textsubscript{3} EXPOSED AT DIFFERENT HUMIDITY LEVELS (ABSTRACTS).
HORTSCIENCE

KOBRINGER, J.M.; TIBBITTS*, T.W.
EFFECT OF HUMIDITY ON THE SENSITIVITY OF PEAS TO O\textsubscript{3} AND SO\textsubscript{2} (ABSTRACT).
HORTSCIENCE
17: 513, 1982. (GWU 4424)
LANG, A.S.; TIBBITTS*, T.W.
OEDEMA OF TOMATO PLANTS: AN AIR CONTAMINANT INDUCED INJURY (ABSTRACT).

LANG, S.P.; TIBBITTS*, T.W.
FACTORS CONTROLLING INTUMESCENCE DEVELOPMENT ON TOMATO PLANTS.

LEE, Y.B.; CAMPBELL*, W.F.
EFFECTS OF BA AND 2,4-D ON SHOOT AND ROOT FORMATION FROM PETIOLE SEGMENTS OF STRAWBERRY PLANT IN VITRO CULTURE (ABSTRACT).
HORTSCIENCE 17(3): 483, 1982. (GWU 5202)

MERRITT, C.; SCOTT, G.W.; GUPTA*, A.; YAVROUIAN, A.
TRANSIENT ABSORPTION SPECTRA OF 2-HYDROXYBENZOPHENONE PHOTOSTABILIZERS.

MITCHELL*, C.A.
CANDIDATE SPECIES SELECTION--CULTURAL AND PHOTOSYNTHETIC ASPECTS.
IN: CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM: FIRST PRINCIPAL INVESTIGATORS MEETING (MOORE, B.; WHARTON, R.A.; MacELROY, R.D., EDS.).

MITCHELL*, C.A.; KNIGHT, S.L.; PAPPAS, T.
PHOTOSYNTHETIC PRODUCTIVITY AND VIBRATION/ACCELERATIONAL STRESS CONSIDERATIONS FOR HIGHER PLANTS IN BIOREGENERATIVE SYSTEMS.
PHYSIOLOGIST 27(6, SUPPL.): S29-S30, 1984. (GWU 6225)

MODELL*, M.; MIESSNER, H.; KAREL*, M.; CARDEN*, J.; LEWIS, S.
TO PRODUCE NUTRIENTS FOR PLANT GROWTH.
IN: CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM: FIRST PRINCIPAL INVESTIGATORS MEETING (MOORE, B.; WHARTON, R.A.; MacELROY, R.D., EDS.).
Morrison, S.L.; Huffaker*, R.C.
Effect of light and plant age on assimilation of nitrate by leaf slices of barley (Abstract).
Plant Physiology
75(1, Suppl.): 30, 1984. (GWU 5824)

Short-term movement of nitrate in soybean shoots using radioactive N-13 (Abstract).
Plant Physiology
72(1, Suppl.): 110, 1983. (GWU 4489)

NIR, Z.; Vogl, O.; Gupta*, A.
Journal of Polymer Science: Polymer Chemistry Edition
20: 2735-2754, 1982. (GWU 2994)

North Central Regional 101 Committee on Growth Chamber Use Quality Assurance Procedures for Accuracy in Environmental Monitoring-Draft Proposal. (Tibbitts*, T.W.)
Biotronics

Osmond, D.L.; Wilson, R.F.; Raper*, C.D., Jr.
Fatty acid composition and nitrate uptake of soybean roots during acclimation to low temperature.

Osmond, D.L.; Wilson, R.F.; Raper*, C.D., Jr.
Fatty acid composition and nitrate uptake of soybean roots during acclimation to low temperature.
Plant Physiology
70: 1689-1693, 1982. (GWU 4873)

Petersen*, G.R.; Schubert, W.W.; Stokes*, B.O.
Applications of mutant yeast strains with low glycogen storage capability.

Petersen*, G.R.; Stokes*, B.O.; Schubert, W.W.; Rodriguez, A.M.
Enhancement of carbohydrates in a methylotrophic yeast.
Enzyme and Microbial Technology
5: 337-341, 1983. (GWU 6239)

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RADMER*, R.; BEHRENS, P.; FERNANDEZ, E.; OLLINGER, O.; HOWELL, C.
ALGAL CULTURE STUDIES RELATED TO A CLOSED ECOLOGICAL LIFE
SUPPORT SYSTEM.
PHYSIOLOGIST

RADMER*, R.; OLLINGER, O.; VENABLES, A; FERNANDEZ, E.
ALGAL CULTURE STUDIES RELATED TO A CLOSED ECOLOGICAL LIFE
SUPPORT SYSTEM (CELSS).
NASA, AMES RESEARCH CENTER, MOFFET FIELD, CA, 35 P., JULY

RADMER*, R.
ALGAL STUDIES RELATED TO CELSS.
IN: GUIDING THE DEVELOPMENT OF A CONTROLLED ECOLOGICAL LIFE
SUPPORT SYSTEM (MASON, R.M., CARDEN, J.L., EDS.).
ATLANTA, GA: METRICS, INC., P. 79-80, 1979. (GWU 3264)

RAPER*, C.D., JR.
PLANT GROWTH IN CONTROLLED ENVIRONMENTS IN RESPONSE TO
CHARACTERISTICS OF NUTRIENT SOLUTIONS.
IN: CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM: FIRST
PRINCIPAL INVESTIGATORS MEETING (MOORE, B.; WHARTON, R.A.;
MacElroy, R.D.; EDS.).
(NASA-CP-2247) (GWU 3960)

RAPER*, C.D., JR.
PLANT GROWTH IN CONTROLLED ENVIRONMENTS IN RESPONSE TO
CHARACTERISTICS OF NUTRIENT SOLUTIONS.
NASA, AMES RESEARCH CENTER, MOFFETT FIELD, CA, 103 P., NOV.

RAPER*, C.D., JR.; POLLOCK, T.A.; THOMAS, J.F.
USE OF PHYTOTRONS IN ASSESSING ENVIRONMENTAL REQUIREMENTS FOR
PLANTS IN SPACE HABITATS.
IN: HUMAN FACTORS OF OUTERSPACE PRODUCTION (CHESTON, T.S.;
WINTER, D.L., EDS.).
BOULDER, CO: WESTVIEW, P. 159-168, 1980. (AAAS SELECTED SYMP.
NO. 50) (GWU 2869)

RUFTY, T.W.; JACKSON, W.A.; RAPER*, C.D.
INHIBITION OF NITRATE ASSIMILATION IN ROOTS IN THE PRESENCE
OF AMMONIUM: THE MODERATING INFLUENCE OF POTASSIUM.
JOURNAL OF EXPERIMENTAL BOTANY
33: 1122-1137, 1982. (GWU 5042)

RUFTY, T.W., JR.; JACKSON, W.A.; RAPER*, C.D., JR.
NITRATE REDUCTION IN ROOTS AS AFFECTED BY THE PRESENCE OF
POTASSIUM AND BY FLUX OF NITRATE THROUGH THE ROOTS.
PLANT PHYSIOLOGY
68: 605-609, 1981. (GWU 3587)
RUFTY, T.W., JR.; RAPER*, C.D., JR.; HUBER, S.C.
ASSIMILATION AND INTERNAL PARTITIONING OF CARBON BY SOYBEAN PLANTS IN RESPONSE TO NITROGEN STRESS.

RUFTY, T.W., JR.; RAPER*, C.D., JR.; JACKSON, W.A.
NITROGEN ASSIMILATION BY SOYBEANS IN RESPONSE TO AMMONIUM AND NITRATE NUTRITION.

RUFTY, T.W., JR.; RAPER*, C.D., JR.; JACKSON, W.A.
NITRATE UPTAKE ROOT AND SHOOT GROWTH, AND ION BALANCE OF SOYBEAN PLANTS DURING ACCLIMATION TO ROOT-ZONE ACIDITY.
BOTANICAL GAZETTE 143: 5-14, 1982. (GWU 4275)

RUFTY, T.W., JR.; VOLK, R.J.; MCCLURE, P.R.; ISRAEL, D.W.; RAPER*, C.D., JR.
RELATIVE CONTENT OF NO₃⁻ AND REDUCED N IN XYLEM EXUDATE AS AN INDICATOR OF ROOT REDUCTION OF CONCURRENTLY ABSORBED NO₃⁻ PLANT PHYSIOLOGY 69: 166-170, 1982. (GWU 4764)

SALISBURY*, F.B.
ACHIEVING MAXIMUM PLANT YIELD IN A WEIGHTLESSNESS, BIOREGENERATIVE SYSTEM FOR A SPACE CRAFT.
PHYSIOLOGIST 27(6, SUPPL.): S31-S34, 1984. (GWU 6202)

SALISBURY*, F.B.
GROUND-BASED STUDIES ON GRAVITROPISM AND ON MAXIMUM YIELD OF WHEAT.
IN: PROCEEDINGS OF A WORKSHOP ON SPACE BIOLOGY, COLOGNE, GERMANY, MARCH 9-11, 1983.
PARIS, FRANCE: EUROPEAN SPACE AGENCY, P. 17-19, 1983. (ESA-SP-206) (GWU 5531)

SALISBURY*, F.B.; ALBRECHTSEN, R.S.; CAMPBELL*, W.F.; DEWEY, W.G.
STUDIES ON MAXIMUM YIELD OF WHEAT AND OTHER SMALL GRAINS IN CONTROLLED ENVIRONMENTS.
STOKES*, B.O.; PETERSEN*, G.R.
AN EVALUATION OF MICROORGANISMS FOR UNCONVENTIONAL FOOD REGENERATION SCHEMES IN CELLS - RESEARCH RECOMMENDATIONS.
PAPER PRESENTED AT THE 12TH INTERSOCIETY CONFERENCE ON ENVIRONMENTAL SYSTEMS, SAN DIEGO, CA, JULY 19-21, 1982, 9 P. (SAE-PAPER-820852) (GWU 5161)

STOKES*, B.O.; PETERSEN*, G.R.; SCHUBERT, W.W.; MUELLER*, W.A.
UNCONVENTIONAL PROCESSES FOR FOOD REGENERATION IN SPACE: AN OVERVIEW.
PAPER PRESENTED AT THE 11TH INTERSOCIETY CONFERENCE ON ENVIRONMENTAL SYSTEMS, SAN FRANCISCO, CA, JULY 13-15, 1981. (GWU 1229)

TANG, A.B.; DALLING, M.J.; HUFFAKER*, R.C.
PROTEOLYTIC ACTIVITIES ASSOCIATED WITH BARLEY CHLOROPLASTS AND CHLOROPLAST COMPONENTS (ABSTRACT).
PLANT PHYSIOLOGY
72(1, SUPPL.): 156, 1983. (GWU 4491)

TANG, A.B.; HUFFAKER*, R.C.
CHARACTERIZATION OF PROTEOLYTIC ACTIVITIES LOCALIZED IN THE THYLAKOID, STROMA, AND ENVELOPE OF BARLEY CHLOROPLASTS (ABSTRACT).
PLANT PHYSIOLOGY
75(1, SUPPL.): 119, 1984. (GWU 5828)

THAYER, J.R.; HUFFAKER*, R.C.
USE OF 13N-NO3− FOR THE ANALYSIS OF NO3- TRANSPORT IN KLEBSIELLA PNEUMONIAE (ABSTRACT).
ABSTRACTS OF PAPERS, AMERICAN CHEMICAL SOCIETY
178(SEPT): NUCL-26, 1979. (GWU 3858)

THAYER, J.R.; HUFFAKER*, R.C.
REGULATION OF NITRATE ASSIMILATION IN BARLEY LEAF SECTIONS BY LIGHT (ABSTRACT).
PLANT PHYSIOLOGY
75(1, SUPPL.): 29, 1984. (GWU 5825)

THAYER, S.S.; HUFFAKER*, R.C.
VACUOLAR LOCALIZATION OF ENDOPEPTIDASES EP1 AND EP2 IN BARLEY MESOPHYLL CELLS (ABSTRACT).
PLANT PHYSIOLOGY
72(1, SUPPL.): 118, 1983. (GWU 4493)

THAYER, S.S.; HUFFAKER*, R.C.
LOCALIZATION AND CHARACTERIZATION OF EXOPEPTIDASES IN BARLEY LEAVES (ABSTRACT).
PLANT PHYSIOLOGY
75(1, SUPPL.): 154, 1984. (GWU 5826)
THOMAS, H.; HUFFAKER*, R.C.
HYDROLYSIS OF RADIOACTIVELY-LABELLED
RIBULOSE-1,5-BISPHOSPHATE CARBOXYLASE BY AN ENDOPEPTIDASE
FROM THE PRIMARY LEAF OF BARLEY SEEDLINGS.
PLANT SCIENCE LETTERS
20: 251-262, 1981. (GWU 3603)

TIBBITTS*, T.W.; BOTTENBERG, G.
GROWTH OF LETTUCE UNDER CONTROLLED HUMIDITY LEVELS.
JOURNAL OF THE AMERICAN SOCIETY FOR HORTICULTURAL SCIENCE
101: 70-73, 1976. (GWU 3023)

TIBBITTS*, T.W.; KOBINGER, J.M.
MODE OF ACTION OF AIR POLLUTANTS IN INJURING HORTICULTURAL
PLANTS (ABSTRACT).
HORTSCIENCE
17: 539, 1982. (GWU 1433)

TIBBITTS*, T.W.
HUMIDITY AND PLANTS.
BIOSCIENCE

TIBBITTS*, T.W.
CANDIDATE SPECIES SELECTION AND CONTROLLED ENVIRONMENT
INJURIES.
IN: CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM: FIRST
PRINCIPAL INVESTIGATORS MEETING (MOORE, B.; WHARTON, R.A.;
(NASA-CP-2247) (GWU 3952)

TIBBITTS*, T.W.; ALFORD, D.K.
USE OF HIGHER PLANTS IN REGENERATIVE LIFE SUPPORT SYSTEMS.
UNIVERSITY OF WISCONSIN, MADISON, AUGUST 1980. (GWU 1203)

TIBBITTS*, T.W.; MORGAN, D.C.; WARRINGTON, I.J.
GROWTH OF LETTUCE, SPINACH, MUSTARD, AND WHEAT PLANTS UNDER
FOUR COMBINATIONS OF HIGH-PRESSURE SODIUM, METAL HALIDE, AND
TUNGSTEN HALOGEN LAMPS AT EQUAL PPFD.
JOURNAL OF THE AMERICAN SOCIETY OF HORTICULTURAL SCIENCE

TIBBITTS*, T.W.; ALFORD, D.K. (EDS.)
CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEMS: USE OF HIGHER
PLANTS. PROCEEDINGS OF TWO NASA WORKSHOPS, O'HARE AIRPORT
CONFERENCE CENTER, CHICAGO, IL, NOV. 1979, AND AMES
RESEARCH CENTER, MOFFETT FIELD, CA, MAR. 1980.
WASHINGTON, DC: NASA, 84P., 1982. (NASA CONFERENCE
PUBLICATION 2231) (GWU 2902)
TRIPEPI, R.R.; MITCHELL*, C.A.
STEM ADAPTATION AND ROOT RESPIRATION OF FLOODED MAPLE AND BIRCH SEEDLINGS (ABSTRACT).
HORTSCIENCE
17: 485, 1982. (GWU 1208)

WAGENET, R.J.; CAMPBELL*, W.F.; BAMATRAF, A.M.; TURNER, D.L.
SALINITY, IRRIGATION FREQUENCY, AND FERTILIZATION EFFECTS ON BARLEY GROWTH.
AGRONOMY JOURNAL
72: 969-974, 1980. (GWU 3089)

WANN, M.; RAPER*, C.D., JR.; LUCAS, H.L., JR.
A DYNAMIC MODEL FOR PLANT GROWTH: A SIMULATION OF DRY MATTER ACCUMULATION FOR TOBACCO.
PHOTOSYNTHETICA

WARD, M.R.; HUFFAKER*, R.C.
ALLEVIATION OF AMMONIUM TOXICITY BY NITRATE IN RADISH PLANTS (ABSTRACT).
PLANT PHYSIOLOGY
72(1, SUPPL.): 111, 1983. (GWU 4488)

WHEELER, R.M.; TIBBITTS*, T.W.
PHOTOPERIOD-LIGHT LEVEL INTERACTIONS ON TUBERIZATION OF POTATO (ABSTRACT).
PLANT PHYSIOLOGY
75(1, SUPPL.): 191, 1984. (GWU 5822)

WHEELER, R.M.; TIBBITTS*, T.W.
POTATO PRODUCTION IN CONTROLLED ENVIRONMENTS: PHOTOPERIOD EFFECTS (ABSTRACT).
HORTSCIENCE
III. Waste Management

BALLOU*, E.; SPITZE*, L.A.; WONG, F.W.; WYDEVEN*, T.J.; JOHNSON, C.C.
ION-EXCHANGE CHROMATOGRAPHY SEPARATION APPLIED TO MINERAL RECYCLE IN CLOSED SYSTEMS.
PAPER PRESENTED AT THE 11TH INTERSOCIETY CONFERENCE ON ENVIRONMENTAL SYSTEMS, SAN FRANCISCO, CA, JULY 13-15, 1981, 7 P.
(ASME PAPER 81-ENAS-21) (GWU 2601)

BALLOU*, E.V.; WYDEVEN*, T.J.; SPITZE*, L.A.
PLANT GROWTH AND MINERAL RECYCLE TRADE-OFFS IN DIFFERENT SCENARIOS FOR A CELSS.
PAPER PRESENTED AT THE 12TH INTERSOCIETY CONFERENCE ON ENVIRONMENTAL SYSTEMS, SAN DIEGO, CA, JULY 19-21, 1982, 7 P.
(SAE-PAPER-82-0855) (GWU 4760)

CARDEN*, J.L.
SOME ISSUES IN COMPARABILITY OF RESULTS AND ANALYTICAL METHODOLOGY IN CELSS WASTE PROCESSING RESEARCH.
IN: CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM: FIRST PRINCIPAL INVESTIGATORS MEETING (MOORE, B.; WHARTON, R.A.; MacELROY, R.D., EDS.).
(NASA-CP-2247) (GWU 3998)

CARDEN*, J.L.; BROWNER, R.
PREPARATION AND ANALYSIS OF STANDARDIZED WASTE SAMPLES FOR CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEMS (CELSS).

COCHRAN, H.D.; DONNELLY, R.G.; MODELL*, M.; BADDOUR, R.F.
THE CARBON MONOXIDE OXIDATION ON A PLATINUM CATALYST.
IN: COLLOID AND INTERFACE SCIENCE, VOL. III: ADSORPTION, CATALYSIS, SOLID SURFACES, WETTING, SURFACE TENSION, AND WATER. (KERKER, M., ED.).
(GWU 4403)

FINDLAY, R.H.; MORIARTY, D.J.W.; WHITE*, D.C.
IMPROVED METHOD OF DETERMINING MURAMIC ACID FROM ENVIRONMENTAL SAMPLES.
GEOMICROBIOLOGY JOURNAL
3(2): 135-150, 1983. (GWU 6246)
FINDLAY, R.H.; WHITE*, D.C.
POLYMERIC BETA-HYDROXYALKANOATES FROM ENVIRONMENTAL SAMPLES
AND BACILLUS MEGATERIUM.
APPLIED AND ENVIRONMENTAL MICROBIOLOGY
45: 71-78, 1983. (GWU 4735)

FINDLAY, R.H.; WHITE*, D.C.
IN SITU DETERMINATION OF METABOLIC ACTIVITY IN AQUATIC
ENVIRONMENTS.
MICROBIOLOGICAL SCIENCES
1(4): 90-95, 1984. (GWU 6250)

FURTHER DEVELOPMENTS IN OXIDATION OF METHANE TRACES WITH
RADIO-FREQUENCY DISCHARGE.
ENVIRONMENTAL SCIENCE & TECHNOLOGY
11: 514-516, 1977. (GWU 2054)

OXIDATION OF CONTAMINATIVE METHANE TRACES WITH
RADIO-FREQUENCY DISCHARGE.
ENVIRONMENTAL SCIENCE & TECHNOLOGY
10: 591-595, 1976. (GWU 2055)

ELECTRIC DISCHARGE FOR TREATMENT OF TRACE CONTAMINANTS.
PATENT.
US-PATENT-4,130,490
9 P., DEC 19, 1978. (GWU 3124)

ELECTRIC DISCHARGE FOR TREATMENT OF TRACE CONTAMINANTS.
PATENT APPLICATION.
US-PATENT-APPL-SN-799832
19 P., 23 MAY, 1977. (GWU 3186)

GEHRON, M.J.; DAVIS, J.D.; SMITH, G.A.; WHITE*, D.C.
DETERMINATION OF THE GRAM-POSITIVE BACTERIAL CONTENT OF SOILS
AND SEDIMENTS BY ANALYSIS OF TEichoACID COMPONENTS.
JOURNAL OF MICROBIOLOGICAL METHODS
2: 165-176, 1984. (GWU 6247)

GEHRON, M.J.; WHITE*, D.C.
SENSITIVE ASSAY OF PHOSPHOLIPID GLYCEROL IN ENVIRONMENTAL
SAMPLES.
JOURNAL OF MICROBIOLOGICAL METHODS
1: 23-32, 1983. (GWU 6245)
HOSHIZAKI*, T.; HANSEN*, B.D., III
GENERIC WASTE MANAGEMENT REQUIREMENTS FOR A CONTROLLED
ECOLOGICAL LIFE SUPPORT SYSTEM (CELSS).
IN: CONTROLLED ECOCLOGICAL LIFE SUPPORT SYSTEM: FIRST
PRINCIPAL INVESTIGATORS MEETING (MOORE, B.; WHARTON, R.A.;
MacELROY, R.D., EDS.).
(NASA-CP-2247) (GWU 3955)

HOSHIZAKI*, T.; HANSEN*, B.D., III
GENERIC WASTE MANAGEMENT REQUIREMENTS FOR A CONTROLLED
ECOLOGICAL LIFE SUPPORT SYSTEM. CELSS.
PAPER PRESENTED AT THE 11TH INTERSOCIETY CONFERENCE ON
ENVIRONMENTAL SYSTEMS, SAN FRANCISCO, CA, JULY 13-15, 1981,
7 P.
(ASME-PAPER-81-ENAS-23) (GWU 5147)

KATZ, M.G.; WYDEVEN*, T.J., JR.
SELECTIVE PERMEABILITY OF PVA MEMBRANES. II. HEAT-TREATED
MEMBRANES.
JOURNAL OF APPLIED POLYMER SCIENCE
27: 79-87, 1982. (GWU 4750)

LEE, S.S.; SHULER*, M.L.
AEROBIC BIOLOGICAL WASTE TREATMENT IN REGENERATIVE LIFE
SUPPORT SYSTEMS.
PAPER PRESENTED AT THE AMERICAN INSTITUTE OF CHEMICAL
ENGINEERS 1983 ANNUAL MEETING, WASHINGTON, D.C., OCT 30-NOV
4, 1983, 23 P.
(PAPER NO. 85E) (GWU 6282)

MARTZ, R.F.; SEBACHER, D.I.; WHITE*, D.C.
BIOMASS MEASUREMENT OF METHANE FORMING BACTERIA IN
ENVIRONMENTAL SAMPLES.
JOURNAL OF MICROBIOLOGICAL METHODS
1: 53-61, 1983. (GWU 5743)

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
DEVELOPMENT OF A PROTOTYPE EXPERIMENT FOR TREATING CELSS AND
PCELSS WASTES TO PRODUCE NUTRIENTS FOR PLANT GROWTH
MASSACHUSETTS INSTITUTE OF TECHNOLOGY, DEPT OF CHEMICAL
ENGINEERING, CAMBRIDGE, MA, 13 P., DECEMBER 1983.
(NASA-CR-173167) (GWU 5593)

MEISSNER*, H.P.; MODELL*, M.
RECYCLING PLANT, HUMAN AND ANIMAL WASTES TO PLANT NUTRIENTS
IN A CLOSED ECOCLOGICAL SYSTEM (ABSTRACT).
PAPER PRESENTED AT THE 9TH INTERSOCIETY CONFERENCE ON
ENVIRONMENTAL SYSTEMS, SAN FRANCISCO, CA, JULY 16-19, 1979,
6 P.
(ASME-PAPER-79-ENAS-29) (GWU 4241)
MODELL*, M.
REFORMING OF ORGANIC SUBSTANCES IN SUPERCRITICAL WATER.
JOURNAL OF THE ELECTROCHEMICAL SOCIETY
127(3): 139C, 1980. (GWU 3164)

MODELL*, M.
REFORMING OF GLUCOSE AND WOOD AT THE CRITICAL CONDITIONS OF
WATER (ABSTRACT).
MECHANICAL ENGINEERING

MODELL*, M.; DEFILIPPI, R.
SUPERCRITICAL FLUID DESORPTION OF PHENOL FROM ACTIVATED
CARBON (ABSTRACT).
CARBON
18: 48, 1980. (GWU 4475)

MODELL*, M.; MEISSNER*, H.; KAREL*, M.; CARDEN*, J.; LEWIS, S.
TREATMENT OF CELSS AND PCELSS WASTE TO PRODUCE NUTRIENTS FOR
PLANT GROWTH.
PAPER PRESENTED AT THE 11TH INTERSOCIETY CONFERENCE ON
ENVIRONMENTAL SYSTEMS, SAN FRANCISCO, CALIFORNIA, JULY 13-15,
1981, 6 P. (ASME PUBL. 81-ENAS-19) (GWU 1199)

MODELL*, M.; SPURLOCK*, J.M.
RATIONALE FOR EVALUATING A CLOSED FOOD CHAIN FOR SPACE
HABITATS.
IN: HUMAN FACTORS OF OUTER SPACE PRODUCTION (CHESTON, T.S.;
WINTER, D.L., EDS.).
BOULDER, CO: WESTVIEW, P. 133-145, 1980. (AAAS SELECTED
SYMPOSIUM NO. 50) (GWU 2785)

MODELL*, M.; SPURLOCK*, J.M.
CLOSED-ECOLOGY LIFE SUPPORT SYSTEMS/CELSS/FOR LONG-DURATION,
MANNED MISSIONS (ABSTRACT).
PAPER PRESENTED AT THE 9TH INTERSOCIETY CONFERENCE ON
ENVIRONMENTAL SYSTEMS, SAN FRANCISCO, CA, JULY 16-19, 1979,
7 P.
(ASME-PAPER-79-ENAS-27) (GWU 4235)

MODELL*, M.
SUSTAINING LIFE IN A SPACE COLONY.
TECHNOLOGY REVIEW

ONISKO, B.L.; WYDEVEN*, T.J.
WET OXIDATION AS A WASTE TREATMENT METHOD IN CLOSED SYSTEMS.
IN: CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM: FIRST
PRINCIPAL INVESTIGATORS MEETING (MOORE, B.; WHARTON, R.A.;
MACELROY, R.D.; EDS.).
(NASA-CP-2247) (GWU 3958)
ONISKO, B.L.; WYDEVEN*, T.J.
PHYTOXICITY STUDY OF THE PRODUCTS OF WET OXIDATION OF A REPRESENTATIVE BIOMASS (LETTUCE).

ONISKO, B.L.; WYDEVEN*, T.J.
WET OXIDATION AS A WASTE TREATMENT IN CLOSED SYSTEMS.
PAPER PRESENTED AT THE 11TH INTERSOCIETY CONFERENCE ON ENVIRONMENTAL SYSTEMS, SAN FRANCISCO, CA, JULY 13-15, 1981, 5 P.
(ASME-PAPER-81-ENAS-22) (GWU 5146)

SENSITIVE ASSAY, BASED ON HYDROXY FATTY ACIDS FROM LIPOPOLYSACCHARIDE LIPID A, FOR GRAM-NEGATIVE BACTERIA IN SEDIMENTS.
APPLIED AND ENVIRONMENTAL MICROBIOLOGY 44: 1170-1177, 1982. (GWU 3432)

PYNE, J.W.; SHULER*, M.L.
FORMATION OF SECONDARY METABOLITES IN A MEMBRANE BIOREACTOR (ABSTRACT).
PLANT PHYSIOLOGY 72(1, SUPPL.): 153, 1983. (GWU 4486)

SHULER*, M.L.
WASTE TREATMENT OPTIONS FOR USE IN CLOSED SYSTEMS.
PAPER PRESENTED AT THE 4TH PRINCETON UNIV-AIAA CONF ON SPACE MANUFACTURING FACILITIES, PRINCETON, NJ, MAY 14-17, 1979, 8P.
(AIAA-PAPER-79-1409) (GWU 4961)

SHULER*, M.L.; LEE, S.; ROLLINS, S.
THE FEASIBILITY OF AN ACTIVATED SLUDGE-ULTRAFILTRATION UNIT FOR USE IN CLOSED ECOLOGICAL LIFE SUPPORT SYSTEMS: EXPERIMENTAL SYSTEM AND PRELIMINARY RESULTS (ABSTRACT).
ABSTRACTS OF PAPERS OF THE AMERICAN CHEMICAL SOCIETY 184: 12, 1982. (GWU 6243)

SHULER*, M.L.; NAFIS, D.; SZE, E.
THE POTENTIAL ROLE OF AEROBIC BIOLOGICAL WASTE TREATMENT IN REGENERATIVE LIFE SUPPORT SYSTEMS.
(ASME-PAPER-81-ENAS-20) (GWU 6281)
RESEARCH PLANNING CRITERIA FOR REGENERATIVE LIFE-SUPPORT SYSTEMS APPLICABLE TO SPACE HABITATS.
IN: SPACE RESOURCES AND SPACE SETTLEMENTS (BILLINGHAM, J., ET AL., EDS.)

SPURLOCK*, J.; MODELL*, M.
SYSTEMS ENGINEERING OVERVIEW FOR REGENERATIVE LIFE-SUPPORT SYSTEMS APPLICABLE TO SPACE HABITATS.
IN: SPACE RESOURCES AND SPACE SETTLEMENTS (BILLINGHAM, J., ET AL., EDS.)

SPURLOCK*, J.M.; MODELL*, M.
COMPARISON OF CLOSURE SCENARIOS FOR CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEMS, APPLICABLE TO MANNED SPACE MISSIONS.
FINAL REPORT -- TASK B (FY 1979).
SOCIETY OF AUTOMOTIVE ENGINEERS, 45 P, APRIL 1980. (GWU 1792)

SPURLOCK*, J.M.; MODELL*, M.
TECHNOLOGY REQUIREMENTS FOR NONTERRESTRIAL ECOSYSTEMS.

SPURLOCK*, J.M.; MODELL*, M.
TECHNOLOGY REQUIREMENTS AND PLANNING CRITERIA FOR CLOSED LIFE SUPPORT SYSTEMS FOR MANNED SPACE MISSIONS: FINAL REPORT.
NASA, WASHINGTON, DC, 67 P., JAN. 1978. (GWU 2910)

SPURLOCK*, J.M.; MODELL*, M.
TECHNOLOGY REQUIREMENTS FOR CLOSED-ECOLOGY LIFE SUPPORT SYSTEMS APPLICABLE TO SPACE HABITATS.

TIMBERLAKE, S.H.; HONG, G.T.; SIMSON, M.; MODELL*, M.
SUPERCRITICAL WATER OXIDATION FOR WASTEWATER TREATMENT: PRELIMINARY STUDY OF UREA DESTRUCTION.
PAPER PRESENTED AT THE 12TH INTERSOCIETY CONFERENCE ON ENVIRONMENTAL SYSTEMS, SAN DIEGO, CA, JULY 19-21, 1982, 10 P. (SAE-PAPER 0872) (GWU 4755)
WEBSTER, I.A.; SHULER*, M.L.
WHOLE-CELL HOLLOW-FIBER REACTOR: TRANSIENT SUBSTRATE
CONCENTRATION PROFILES.
BIOTECHNOLOGY AND BIOENGINEERING
23: 447-450, 1981. (GWU 3440)

WHITE*, D.C.
ANALYSIS OF MICROORGANISMS IN TERMS OF QUANTITY AND ACTIVITY
IN NATURAL ENVIRONMENTS.
IN: MICROBES IN THEIR NATURAL ENVIRONMENT (SLATER, J.H.;
(GWU 6244)

WHITE*, D.C.
CHEMICAL CHARACTERIZATION OF FILMS.
IN: MICROBIAL ADHESION AND AGGREGATION (MARSHALL, K.C., ED.).
BERLIN: SPRINGER VERLAG, P. 159-176, 1984. (GWU 6249)

WHITE*, D.C.; SMITH, G.A.; GEHRON, M.J.; PARKER, J.H.; FINDLAY,
R.H.; MARTZ, R.F.; FREDRICKSON, H.L.
THE GROUNDWATER AQUIFER MICROBIOTA: BIOMASS, COMMUNITY
STRUCTURE, AND NUTRITIONAL STATUS.
DEVELOPMENTS IN INDUSTRIAL MICROBIOLOGY
24: 201-211, 1983. (GWU 6271)

WYDEVEN*, T.J.
RECOMMENDATIONS OF THE PANELS: PANEL ON OZONE DESTRUCTION
TECHNIQUES.
IN: OZONE CONTAMINATION IN AIRCRAFT CABINS.
(GWU 3351)
IV. System Management and Control

AROESTE, H.
APPLICATION OF GUIDED INQUIRY SYSTEM TECHNIQUE (GIST) TO CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM (CELSS).

AUSLANDER*, D.M.
CELSS SYSTEM CONTROL OVERVIEW.

AUSLANDER*, D.M.
SPATIAL EFFECTS ON THE STABILITY OF A FOOD-LIMITED MOTH POPULATION.

AUSLANDER*, D.M.; SPEAR, R.C.; YOUNG, G.F.
APPLICATION OF CONTROL THEORY TO DYNAMIC SYSTEMS SIMULATION.

AUSLANDER*, D.M.; SPEAR, R.C.; YOUNG, G.E.
A SIMULATION-BASED APPROACH TO THE DESIGN OF CONTROL SYSTEMS WITH UNCERTAIN PARAMETERS.
JOURNAL OF DYNAMIC SYSTEMS, MEASUREMENT AND CONTROL 104: 20-26, 1982. (GWU 3861)

AVERNER*, M.M.; KAREL*, M.; RADMER*, R.
PROBLEMS ASSOCIATED WITH THE UTILIZATION OF ALGAE IN BIOREGENERATIVE LIFE SUPPORT SYSTEMS.

AVERNER*, M.M.; MacELROY*, R.D.
The CELSS PROGRAM: AN OVERVIEW OF ITS STRUCTURE AND USE OF COMPUTER MODELLING.
Averner*, M.M.; MacElroy*, R.D.

Averner*, M.M.
An Approach to the Mathematical Modelling of a Controlled Ecological Life Support System.

Boettger, H.G.; Giffin*, C.E.; Norris, D.D.; Dreyer, W.J.; Kupfermann, A.
Electro-Optical Ion Detection: A Novel Approach to the Application of Mass Spectrometers in Biomedical Research and Clinical Analysis.

Boettger, H.G.; Giffin*, C.E.; Norris, D.D.
Electro-optical Ion Detectors in Mass Spectrometry Simultaneous Monitoring of All Ions Over Wide Mass Ranges.
In: Multichannel Image Detectors (Talmi, Y., Ed.).

Boettger, H.G.; Giffin*, C.E.; Norris*, D.D.
Electro-optical Ion Detector for Simultaneous Monitoring of All Ion Species Over a Wide Range (Abstract).

Colombano*, S.
Control Problems in Autonomous Life Support Systems.

Grant, M.A.; Hochstein*, L.I.
A Dissimilatory Nitrite Reductase from Paracoccus Halodenitrificans (Abstract).
Abstracts of the American Society for Microbiology 83: 187, 1983. (GWU 6278)

Grant, M.A.; Hochstein*, L.I.
Separation of Nitrite and Nitric Oxide Reductase Activities in Paracoccus Halodenitrificans (Abstract).
Abstracts of the American Society for Microbiology 84: 163, 1984. (GWU 6279)
GUSTAN, E.; VINOPAL, T.
CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM: TRANSPORTATION ANALYSIS.

GUSTAN, E.A.; VINOPAL, T.J.; OLSON*, R.L.
A NEAR-TERM MISSION FOR CELSS.
PAPER PRESENTED 13TH INTERSOCIETY CONFERENCE ON ENVIRONMENTAL SYSTEMS, SAN FRANCISCO, CA, JULY 11-13, 1983, 12 P. (SAE PAPER 831149) (GWU 6046)

HANSON*, J.A.
WORKSHOP ON CLOSED SYSTEM ECOLOGY, HELD AT THE CALIFORNIA INSTITUTE OF TECHNOLOGY, PASADENA, CALIFORNIA, 18-22 JANUARY 1982.
ENVIRONMENTAL CONSERVATION 9(4): 357-359, 1982. (GWU 6233)

HOCHESTEIN*, L.I.; CRONIN, S.E.
ELECTRON TRANSPORT IN PARACOCCUS HALODENITRIFICANS AND THE ROLE OF UBIQUINONE.

HOCHESTEIN*, L.I.; TOMLINSON, G.A.
The growth of PARACOCCUS HALODENITRIFICANS in a defined medium.

HORNBERGER, G.M.; RASTETTER, E.B.
SENSITIVITY ANALYSIS AS AN AID IN MODELLING AND CONTROL OF (POORLY-DEFINED) ECOLOGICAL SYSTEMS.
NASA, AMES RESEARCH CENTER, MOFFETT FIELD, CA, 23 P, MAR 1982. (GWU 2639)

HORNBERGER, G.M.; RASTETTER, E.B.
SENSITIVITY ANALYSIS AS AN AID IN MODELLING AND CONTROL OF (POORLY-DEFINED) ECOLOGICAL SYSTEMS.

JET PROPULSION LABORATORY
SUMMARY REPORT OF THE WORKSHOP ON MATERIALLY CLOSED ECOSYSTEM RESEARCH HELD AT THE CALIFORNIA INSTITUTE OF TECHNOLOGY.
CALIFORNIA INSTITUTE OF TECHNOLOGY, JET PROPULSION LABORATORY, PASADENA, CA, 18 P. MARCH 15, 1982. (GWU 3886)
JOHNSON, E.J.
GENETIC ENGINEERING POSSIBILITIES FOR CELSS: A BIBLIOGRAPHY AND SUMMARY OF TECHNIQUES.

KAUFMANN, R.K.; MOORE*, B., III.; AVERNER*, M.
MODELLING GAS EXCHANGE IN CLOSED BIOLOGICAL SYSTEMS.
IN: ANALYSIS OF ECOLOGICAL SYSTEMS: STATE-OF-THE-ART IN ECOLOGICAL MODELLING
AMSTERDAM: ELSEVIER SCIENTIFIC PUBLISHING, P. 219-227, 1983. (GWU 6284)

MacELROY*, R.D.
CURRENT CONCEPTS OF THE CELSS PROGRAM.
IN: CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM: FIRST PRINCIPAL INVESTIGATORS MEETING (MOORE, B.; WHARTON, R.A.; MacELROY, R.D., EDS.).

MacELROY*, R.D.
FARMING IN SPACE.
NEW YORK: JOHN WILEY & SONS, P. 157-165, 1983. (GWU 6273)

MAGUIRE, B., JR.
LITERATURE REVIEW OF HUMAN MICROBES' INTERACTION WITH PLANTS.
(NASA-CR-166330) (GWU 2804)

MASON*, R.M.
CELSS SCENARIO ANALYSIS: BREAKEVEN CALCULATIONS.

MASON*, R.M.; CARDEN*, J.L. (EDS.)
GUIDING THE DEVELOPMENT OF A CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM.
REPORT ON NASA WORKSHOP HELD AT AMES RESEARCH CENTER, MOFFETT FIELD, CA, JANUARY 8-12, 1979, 93 P. N (GWU 3241)

MOORE*, B., III.; WHARTON, R.A., JR.; MacELROY*, R.D. (EDS.)
CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM: FIRST PRINCIPAL INVESTIGATORS MEETING.
MOORE*, B., III; KAUFMANN, R.; REINHOLD, G.
DESIGN AND CONTROL STRATEGIES FOR CELSS; INTEGRATING
MECHANISTIC PARADIGMS AND BIOLOGICAL COMPLEXITIES.
PAPER PRESENTED AT THE INTERSOCIETY CONFERENCE ON
ENVIRONMENTAL SYSTEMS, SAN FRANCISCO, CALIFORNIA, JULY 13-15,
1981, 7 P. (GWU 3289)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, JET PROPULSION
LABORATORY.
WORKSHOP ON CLOSED SYSTEM ECOLOGY. SUMMARY REPORT.
PASADENA, CA: NASA, JET PROPULSION LABORATORY, CALIFORNIA
INSTITUTE OF TECHNOLOGY, 15 P., JULY 1982. (JPL-PUBL-82-64)
(GWU 3611)

POPMA*, D.C.; SPURLOCK*, J.M.
FUTURE ROLES OF LIFE SCIENCES IN SPACE HABITATION.
IN: PREPRINTS OF 1978 ANNUAL SCIENTIFIC MEETING, AEROSPACE
MEDICAL ASSOCIATION, NEW ORLEANS, LA, MAY 8-11, 1978.
WASHINGTON, D.C.: AEROSPACE MEDICAL ASSOCIATION, P. 158-
159, 1978. (GWU 2076)

REINHOLD, C.
SOYCHMBR.I - A MODEL DESIGNED FOR THE STUDY OF PLANT GROWTH
IN A CLOSED CHAMBER (ABSTRACT).
PAPER PRESENTED AT THE 12TH INTERSOCIETY CONFERENCE ON
ENVIRONMENTAL SYSTEMS, SAN DIEGO, CA, JULY 19-21, 1982, 17 P.
(SAE-PAPER-820853) (GWU 5160)

SCHWARTZKOPF*, S.H.; STOFAN, P.E.
A CHAMBER DESIGN FOR CLOSED ECOLOGICAL SYSTEMS RESEARCH.
PAPER PRESENTED AT THE 11TH INTERSOCIETY CONFERENCE ON
ENVIRONMENTAL SYSTEMS, SAN FRANCISCO, CA, JULY 13-15, 1981,
5 P. (ASME PAPER 81-ENAS-37) (GWU 1228)

SLOBODKIN*, L.B.; BOTKIN*, D.B.; MAGUIRE, B., JR.; MOORE*, B.,
III.; MOROWITZ, H.
ON THE EPISTEMOLOGY OF ECOSYSTEM ANALYSIS.
IN: ESTUARINE PERSPECTIVES (KENNEDY, V.S., ED.).
NEW YORK: ACADEMIC, P. 497-507, 1980. (GWU 4353)

STAHR, J.D.; AUSLANDER*, D.M.; SPEAR, R.C.; YOUNG, G.E.
AN APPROACH TO THE PRELIMINARY EVALUATION OF CLOSED-ECOLOGY
LIFE SUPPORT SYSTEM (CELSS) SCENARIOS AND CONTROL STRATEGIES.
PAPER PRESENTED AT THE ELEVENTH INTERSOCIETY CONFERENCE ON
ENVIRONMENTAL SYSTEMS, SAN FRANCISCO, CA, JULY 13-15, 1981,
7 P. (ASME PAPER 81-ENAs-38) (GWU 3138)
STAHR, J.D.; AUSLANDER*, D.M.; SPEAR, R.C.; YOUNG, G.E.
AN APPROACH TO THE PRELIMINARY EVALUATION OF CLOSED
ECOLOGICAL LIFE SUPPORT SYSTEM (CELSS) SCENARIOS AND CONTROL
STRATEGIES.
NASA, AMES RESEARCH CENTER, MOFFETT FIELD, CA, 47 P., JULY

STEPHANOPoulos*, G.; SAN, K.-Y.
DATA HANDLING FOR ON-LINE MONITORING OF GROWING MICROBIAL
CULTURES.
ABSTRACTS OF PAPERS, AMERICAN CHEMICAL SOCIETY
182(AUG.): INDE-74, 1981. (GWU 4806)

VINOPAL, T.; GUSTAN, E.; OLSON*, R.
PROBABLE MISSIONS AND TRANSPORTATION SCENARIOS TO USE
REGENERATIVE LIFE SUPPORT SYSTEMS.
IN: SPACE MANUFACTURING 1983 (BURKE, J.D.; WHITT, A.S.,
EDS.).
SAN DIEGO, CA: AMERICAN ASTRONAUTICAL SOCIETY, P. 27-43,
1983. (GWU 6283)

YOUNG, G.
A DESIGN METHODOLOGY FOR NONLINEAR SYSTEMS CONTAINING
PARAMETER UNCERTAINTY: APPLICATION TO NONLINEAR CONTROLLER
DESIGN.
(GWU 3195)

YOUNG, G.E.; AUSLANDER*, D.M.
A DESIGN METHODOLOGY FOR NONLINEAR SYSTEMS CONTAINING
PARAMETER UNCERTAINTY.
JOURNAL OF DYNAMIC SYSTEMS, MEASUREMENT, AND CONTROL:
TRANSACTIONS OF THE ASME
106: 15-20, 1984. (GWU 6229)
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