

719
6

AUSTRALIAN JOURNAL
OF
BIOLOGICAL SCIENCES

VOLUME 22

MELBOURNE
1969

AUSTRALIAN JOURNAL OF BIOLOGICAL SCIENCES

A medium for the publication of results of original scientific research in the biological sciences with special emphasis on the experimental phases.

Published by the Commonwealth Scientific and Industrial Research Organization.
Issued six times a year, \$A4 per annum.

BOARD OF STANDARDS

The Board of Standards for this Journal is appointed by the Commonwealth Scientific and Industrial Research Organization and the Australian Academy of Science and consists of Professor C. W. Emmens (Chairman), Mr. A. E. Scott (Editor-in-Chief), Professor C. M. Donald, Dr. S. D. Hamann, Professor C. B. O. Mohr, and Professor G. H. Satchell.

ADVISORY COMMITTEE

Acceptance of papers for this Journal is in the hands of an Advisory Committee appointed by the Board of Standards and consisting of Mr. A. E. Scott (Editor-in-Chief and Chairman), Professor C. W. Emmens, Dr. L. T. Evans, Professor F. J. R. Hird, Professor M. G. Pitman, and Professor G. H. Satchell,



All enquiries and manuscripts should be forwarded to:

The Editor-in-Chief,
Editorial and Publications Section, CSIRO,
Sixth Floor,
372 Albert Street,
East Melbourne, Victoria 3002

CONTENTS

NUMBER 1, FEBRUARY 1969

	PAGE
The effect of water stress on translocation in relation to photosynthesis and growth. II. Effect during leaf development in <i>Lolium temulentum</i> L. By I. F. Wardlaw	1
Effect of moisture stress on submicroscopic structure of maize roots. By I. Nir, S. Klein, and A. Poljakoff-Mayber	17
An analysis of the water potential isotherm in plant tissue. II. Comparative studies on leaves of different types. By I. Noy-Meir and B. Z. Ginzburg ..	35
The effects of day length and light intensity on the growth of barley. VI. Interactions between the effects of temperature, photoperiod, and the spectral composition of the light source. By D. Aspinall	53
Effects of water, light, and nutrition on flower-bud initiation in apricots. By D. I. Jackson	69
The uptake and effects of calcium and phosphate on maturity, lignification, and peroxidase activity of wheat internodes. By R. W. Parish and F. L. Miller	77
Respiration and ripening of banana fruit slices. By J. K. Palmer and W. B. McGlasson	87
The development of the cuticular wax layer in prune plums and the changes occurring in it during drying. By Joan M. Bain and D. McG. McBean ..	101
Crown gall of stone fruit. I. Isolation of <i>Agrobacterium tumefaciens</i> and related species. By A. Kerr	111
The prediction of selection response in a self-fertilizing species. I. Individual selection. By D. G. Pederson	117
Selection in reference to biological groups. IV. Application of selection index theory. By B. Griffing	131
Effects of artificial selection on rates of inbreeding in populations of <i>Drosophila melanogaster</i> . I. Effect in early generations. By L. P. Jones	143
Effects of artificial selection on rates of inbreeding in populations of <i>Drosophila melanogaster</i> . II. Effect of previous selection on rates of inbreeding. By L. P. Jones	157
Development of dormant blastocysts induced by oestrogen in the ovariectomized marsupial, <i>Macropus eugenii</i> . By Meredith J. Smith and G. B. Sharman	171
Passage, survival, and fertility of deep-frozen ram semen in the genital tract of the ewe. By P. E. Mattner, K. W. Entwistle, and I. C. A. Martin ..	181

NUMBER 1, FEBRUARY 1969 (*Continued*)

	PAGE
Composition and output of lipid in the thoracic duct lymph of the newborn calf. By A. D. Shannon and A. K. Lascelles	189
Effect of skim-milk feeding on the flow and composition of thoracic duct and intestinal lymph in young calves. By A. D. Shannon and A. K. Lascelles	197
Action of dinitrophenyl amino acids on skeletal muscle proteins. III. Effect of partially blocking myosin sulphydryl groups on absorption of bis-dinitro- phenyl-lysine; implications for the structure of myosin with modified enzyme activity. By R. W. Burley and Jean P. Robertson	205
Proteins of keratin and their synthesis. I. Proteins of prekeratin and keratin. By I. E. B. Fraser	213
Proteins of keratin and their synthesis. II. Incorporation of [³⁵ S]cystine into prekeratin and keratin proteins. By I. E. B. Fraser	231
Chemical characterization of a non-covalently linked peptide from plakalbumin. By R. Sleight, R. Hosken, M. B. Smith, and E. O. P. Thompson	239
Studies on tetanus toxin and toxoid. III. Sedimentation of toxin and derivatives obtained by sulphite and aldehyde treatments. By D. J. Dawson and L. W. Nichol	247

Short Communications

The developmental fate of endoplasmic reticulum in the sieve element of <i>Pisum</i> . By S.-Y. Zee	257
Studies on wheat peroxidase. By R. W. Parish	261
Hydrolysis of plant mannans by rumen protozoal enzymes. By R. W. Bailey and Blanche D. E. Gaillard	267
<i>Mycoplasma</i> -like bodies in plants affected by legume little leaf, tomato big bud, and lucerne witches' broom diseases. By J. W. Bowyer, J. G. Atherton, D. S. Teakle, and Gabrielle A. Ahern	271
Relative effects of soil nitrogen and soil organisms on survival of <i>Ophiobolus</i> <i>graminis</i> . By S. C. Chambers and N. T. Flentje	275
Corrigendum	278

NUMBER 2, APRIL 1969

Studies of dormancy in the seeds of subterranean clover (<i>Trifolium sub-</i> <i>terraneum</i> L.). III. Dormancy breaking by low concentrations of oxygen. By L. A. T. Ballard and A. E. Grant Lipp	279
Plant water status and carbon dioxide exchange of cotton leaves. By J. H. Troughton	289
Vernalization, photoperiodic induction, and flower initiation in the late pea cultivar Greenfeast. By D. M. Paton	303

NUMBER 2, APRIL 1969 (Continued)

	PAGE
The mobility of ^{65}Zn in <i>Trifolium subterraneum</i> L. and <i>Antirrhinum majus</i> L. By C. R. Millikan, B. C. Hanger, and E. N. Bjarnason	311
Translocation and remobilization of ^{14}C assimilated at different stages by each leaf of the wheat plant. By H. M. Rawson and G. Hofstra	321
Effects of extending the day length with low-intensity light on the growth of wheat and cocksfoot. By G. Hofstra, G. J. A. Ryle, and R. F. Williams	333
Effects of indoleacetic acid on lignification in wheat internodes and <i>in vitro</i> . By R. W. Parish	343
A comparison of the effects of metabolic inhibitors on chloride uptake and photosynthesis in <i>Chara corallina</i> . By F. A. Smith and K. R. West	351
The role of pH in the punch-through effect in the electrical characteristics of <i>Chara australis</i> . By H. G. L. Coster	365
Preprophase microtubules and stomatal differentiation in <i>Commelina cyanea</i> . By J. D. Pickett-Heaps	375
Factors affecting viability of spore inoculum in <i>Peronospora tabacina</i> Adam and lesion production in tobacco plants. I. The inoculum. By A. V. Hill	393
Factors affecting viability of spore inoculum in <i>Peronospora tabacina</i> Adam and lesion production in tobacco plants. II. Lesion production. By A. V. Hill	399
Host specificity in the root hair "curling factor" of <i>Rhizobium</i> spp. By Phaik Y. Yao and J. M. Vincent	413
Induction of NAD-specific glutamate dehydrogenase in <i>Neurospora crassa</i> by addition of glutamate to the media. By W. N. Strickland	425
Effect of subdermal pressure on the skin and its appendages in the sheep. By M. Jolly and A. G. Lyne	433
Studies on marsupial proteins. I. Polymorphism of haemoglobin of the grey kangaroo, <i>Macropus giganteus</i> . By E. O. P. Thompson, R. Hosken, and G. M. Air	449
Subunits from reduced and <i>S</i> -carboxymethylated ribulose diphosphate carboxylase (fraction I protein). By K. E. Moon and E. O. P. Thompson	463
Studies on reduced wool. IX. The <i>N</i> -terminal sequence of a fragment produced by cleavage of component 8 with cyanogen bromide. By I. J. O'Donnell	471

Short Communication

Ethylene production by slices of green banana fruit and potato tuber tissue during the development of induced respiration. By W. B. McGlasson	489
--	-----

NUMBER 3, JUNE 1969

	PAGE
Enhanced heterosis and stability in the growth of an interspecific <i>Phalaris</i> hybrid at high temperature. By J. R. McWilliam, B. D. H. Latter, and M. J. Mathison	493
Effects of temperature on growth and nutrient uptake in subterranean clover during recovery from phosphorus stress. I. Growth changes. By D. Bouma and E. J. Dowling	505
Effects of temperature on growth and nutrient uptake in subterranean clover during recovery from phosphorus stress. II. Phosphorus uptake and distribution. By D. Bouma and E. J. Dowling	515
Effects of changes in boron nutrition on growth and development of subterranean clover. By D. Bouma	523
Interaction between calcium level and nitrogen source on growth and ⁴⁵ Ca distribution in subterranean clover. By C. R. Millikan, B. C. Hanger, and E. N. Bjarnason	535
Movement of foliar-applied ⁴⁵ Ca in Brussels sprouts. By C. R. Millikan and B. C. Hanger	545
Timing of evocation and development of flowers in <i>Pharbitis nil</i> . By R. W. King and L. T. Evans	559
Evidence for a direct involvement of electron transport in the high-affinity ion accumulation system of aged beet parenchyma. By G. M. Polya and M. R. Atkinson	573
The electrochemical state of cells of broad bean roots. II. Potassium kinetics in excised root tissue. By C. K. Pallaghy and B. I. H. Scott	585
Reversion of senescence: effects of 2,4-dichlorophenoxyacetic acid and indoleacetic acid on respiration, ethylene production, and ripening of banana fruit slices. By M. Vendrell	601
Accumulation and translocation of sorbitol in apple phloem. By R. L. Bielecki	611
Cytokinins as endogenous growth regulators in the algae <i>Ecklonia</i> (Phaeophyta) and <i>Hypnea</i> (Rhodophyta). By R. C. Jennings	621
The feeding sites in <i>Sonchus oleraceus</i> of <i>Hyperomyzus lactucae</i> , the aphid vector of lettuce necrotic yellows virus. By G. T. O'Loughlin and T. C. Chambers	629
Fine structure and electron cytochemical studies of <i>Sclerotium rolfsii</i> Sacc. By N. G. Nair, N. H. White, D. M. Griffin, and Suzanne Blair	639
Observations on the development and structure of the vitelline membrane of the hen's egg: an electron microscope study. By Joan M. Bain and Janice M. Hall	653
Reproductive performance and body weights of mice maintained for 12 generations at 34°C. By Pamela R. Pennycuik	667

NUMBER 3, JUNE 1969 (*Continued*)

	PAGE
Physiological and morphological characteristics of mice moved to 21°C after 10 generations at 34°C. By Pamela R. Pennycuik	677
Interactions between oestradiol 3,17 β and progesterone on the induction and growth of decidualomata in ovariectomized mice. By K. W. Humphrey	689
Accumulation of carboxylic acids from glucose by the pre-implantation mouse embryo. By R. G. Wales	701
Further studies of the deep freezing of rabbit spermatozoa in reconstituted skim milk powder. By T. O'Shea and R. G. Wales	709
Metabolism of semen after freezing. I. Effects of washing, skim-milk solids, and potassium and magnesium ions on the metabolism of thawed ram and bull spermatozoa. By T. O'Shea	721
Metabolism of semen after freezing. II. The aerobic metabolism of ram spermatozoa before and after storage at -79°C. By T. O'Shea	733
The growth and composition of wool. V. Stimulation of wool growth by the abomasal administration of varying amounts of casein. By P. J. Reis	745

Short Communications

Effects of exogenous moulting hormones on puparium formation in <i>Calliphora</i> . By J. A. Thomson and D. H. S. Horn	761
Effects of exposure to 21 and 34°C on the outcome of overlapping reproductive cycles in the mouse. By Pamela R. Pennycuik	767
Corrigendum	771

NUMBER 4, AUGUST 1969

Inflorescence initiation in <i>Lolium temulentum</i> L. XIII. The role of gibberellins. By L. T. Evans	773
Physiological studies on dormancy in Cape tulip. By B. K. Taylor	787
Ion absorption in <i>Atriplex</i> leaf tissue. II. Secretion of ions to epidermal bladders. By C. B. Osmond, U. Lüttge, K. R. West, C. K. Pallaghy, and B. Shacher-Hill	797
Plant water status, leaf temperature, and the calculated mesophyll resistance to carbon dioxide of cotton leaves. By J. H. Troughton and R. O. Slatyer	815
Physical environment and symbiotic nitrogen fixation. VI. Nitrogen retention within the nodules of <i>Trifolium subterraneum</i> L. By A. H. Gibson	829
Physical environment and symbiotic nitrogen fixation. VII. Effect of fluctuating root temperature on nitrogen fixation. By A. H. Gibson	839

NUMBER 4, AUGUST 1969 (*Continued*)

	PAGE
The action of 2,4-dinitrophenol on corn root mitochondria. By D. E. Bottrill and J. B. Hanson	847
Cell division in <i>Oedogonium</i> . I. Mitosis, cytokinesis, and cell elongation. By J. D. Pickett-Heaps and L. C. Fowke	857
Heterokaryon formation and genetic recombination within one isolate of <i>Thanatephorus cucumeris</i> . By A. R. McKenzie, N. T. Flentje, Helena M. Stretton, and M. Jean Mayo	895
Identity of the fungal symbiont of <i>Sirex noctilio</i> . By I. P. C. Gaut	905
The mechanism of pathogenicity of <i>Sirex noctilio</i> on <i>Pinus radiata</i> . I. Effects of the symbiotic fungus <i>Amylostereum</i> sp. (Thelophoraceae). By M. P. Coutts	915
An experimental approach to the study of multiple peak epistasis in <i>Drosophila melanogaster</i> . By R. F. Nassar	925
Developmental changes in the late larva of <i>Calliphora stygia</i> . II. Protein synthesis. By Marjory-D. Martin, Judith F. Kinnear, and J. A. Thomson	935
Spermatozoal head shape in two inbred strains of mice and their F ₁ and F ₂ progenies. By Liia Illisson	947
Quantitative changes in mouse liver ultrastructure following cortisone and insulin administration. By Pamela J. Birchmeier	965
The survival of single blastomeres of pigs' eggs transferred to recipient gilts. By N. W. Moore, C. Polge, and L. E. A. Rowson	979
Studies of the suitability of preparations of ewe and cow milk for storing ram spermatozoa at 37, 5, and -79°C. By R. C. Jones	983
Influence of diluents and processing times after ejaculation on the survival of deep-frozen ram spermatozoa. By R. C. Jones	995
The intracellular accumulation of metabolites by ram spermatozoa during incubation in the presence of exogenous fructose. By R. G. Wales and E. J. Humphries	1005
Dietary and endogenous long-chain fatty acids in the intestine of sheep, with an appendix on their estimation in feeds, bile, and faeces. By T. J. Heath and L. N. Hill	1015
Protein associated with hyaluronic acid in ox synovial fluid. By Panee Silpananta, J. R. Dunstone, and A. G. Ogston	1031
Interaction of linear analogues of D-glucose with the β -glucosidase of <i>Stachybotrys atra</i> . By M. A. Jermyn	1039

NUMBER 4, AUGUST 1969 (*Continued*)*Short Communications*

	PAGE
The localization of acid phosphatase in the sieve element of <i>Pisum</i> . By S.-Y. Zee	1051
Genetically controlled electrophoretic variants of a starch-degrading enzyme in <i>Zea mays</i> . By D. J. Finnegan	1055
Effect of oxygen and carbon dioxide on the mitochondria of <i>Sclerotium rolfsii</i> . By N. G. Nair, N. H. White, D. M. Griffin, and Suzanne Blair	1061
Storage of two-cell mouse embryos <i>in vitro</i> . By D. G. Whittingham and R. G. Wales	1065
Comparison of the distribution of motile and immotile spermatozoa in the ovine cervix. By P. E. Mattner and A. W. H. Braden	1069
Effect of feeding lupine seeds on spermatogenesis in the rat. By R. I. Tannous and S. N. Nayfeh	1071
Growth curves for body weight of the laboratory rat. By P. J. Pahl	1077
Extraction of reduced wool proteins by solutions of salts. By J. A. Maclaren and D. J. Kilpatrick	1081
Heterogeneity in a high-sulphur protein from wool. By R. Frater	1087

NUMBER 5, OCTOBER 1969

Effects of vernalization, photoperiod, and the cotyledon on flower initiation in Greenfeast peas. By J. J. Amos and R. K. Crowden	1091
Concomitant photosynthesis implicated in the light effect on translocation in bean plants. By Z. Plaut and Leonora Reinhold	1105
The utilization of root organic compounds during the regeneration of lucerne. By K. C. Hodgkinson	1113
The uptake of orthophosphate and its incorporation into organic phosphates along roots of <i>Pinus radiata</i> . By G. D. Bowen	1125
Sugar and ion transport in isolated onion epidermis. By W. Steinbrecher and U. Lüttge	1137
Physiology of pea fruits. VI. Changes in uridine diphosphate glucose pyrophosphorylase and adenosine diphosphate glucose pyrophosphorylase in the developing seed. By J. F. Turner	1145
The mechanism of pathogenicity of <i>Sirex noctilio</i> on <i>Pinus radiata</i> . II. Effects of <i>S. noctilio</i> mucus. By M. P. Coutts	1153

NUMBER 5, OCTOBER 1969 (*Continued*)

	PAGE
Ionic relations of marine algae. I. <i>Griffithsia</i> : membrane electrical properties. By G. P. Findlay, A. B. Hope, and E. J. Williams	1163
Membrane fluxes and electric conductance in characean cells. By N. A. Walker and A. B. Hope	1179
The possibility of common amino acid sequences in high-sulphur protein fractions from wool. By R. L. Darskus, J. M. Gillespie, and H. Lindley	1197
Keratin fibres. II. Separation and analysis of medullary cells. By J. H. Bradbury and J. M. O'Shea	1205
Studies on tetanus toxin and toxoid. IV. Interaction of formaldehyde with tetanus toxin. By D. J. Dawson and C. M. Mauritzen	1217
Physiologic specialization in <i>Drechslera teres</i> . By T. N. Khan and W. J. R. Boyd	1229
Environmentally induced variability in the host reaction of barley to net blotch. By T. N. Khan and W. J. R. Boyd	1237
The prediction of selection response in a self-fertilizing species. II. Family selection. By D. G. Pederson	1245
Sex dimorphism and canalization in <i>Drosophila melanogaster</i> . By G. L. Lee and A. S. Fraser	1259
Incorporation and metabolism of cysteine in the haemolymph and saliva of a plant bug. By P. W. Miles	1271
Ribonuclease activity and nucleic acid and protein metabolism in the testes of zinc-deficient rats. By M. Somers and E. J. Underwood	1277
Effect of time of insemination on the distribution of spermatozoa in the genital tract in ewes. By P. E. Mattner and A. W. H. Braden	1283

Short Communications

Diffusion of carbon compounds away from wheat roots. By A. D. Rovira	1287
Studies on the formation of epicormic shoots on eucalypt stem segments. By E. P. Bachelard	1291

NUMBER 6, DECEMBER 1969

The dissolution and reaccumulation of starch granules in grape vine cane. By M. S. Buttrose	1297
A comparison of the effects of Cycocel and tipping on fruit set in <i>Vitis</i> <i>vinifera</i> L. By K. G. M. Skene	1305

NUMBER 6, DECEMBER 1969 (Continued)

	PAGE
The uptake of nitrate and ammonium by successive zones of the pea radicle. By V. O. Grasmanis and K. P. Barley	1313
Starch synthesis and changes in uridine diphosphate glucose pyrophosphorylase and adenosine diphosphate glucose pyrophosphorylase in the developing wheat grain. By J. F. Turner	1321
Effect of soil amendments on numbers of soil microorganisms and on the root rot- <i>Fusarium</i> wilt complex of peas. By M. Bumbieris	1329
Energy-transducing reactions in biological membranes. I. Energy trans- duction in ion- and electron-exchange polymers. By D. E. Weiss ..	1337
Energy-transducing reactions in biological membranes. II. A molecular mechanism for the permeability changes in nerve during the passage of an action potential. By D. E. Weiss	1355
Energy-transducing reactions in biological membranes. III. A model of the sodium pump and its possible relevance to some other active transport processes. By D. E. Weiss	1373
Energy-transducing reactions in biological membranes. IV. A model of oxidative phosphorylation and ion accumulation in mitochondria based on a thioacylation mechanism. By D. E. Weiss	1389
Succinic acid production by rumen bacteria. III. Enzymic studies on the formation of succinate by <i>Ruminococcus flavefaciens</i> . By M. F. Hopgood and D. J. Walker	1413
The extractives of the mycorrhizas and roots of <i>Pinus radiata</i> and <i>Pseudotsuga</i> <i>menziesii</i> . By W. E. Hillis and N. Ishikura	1425
Studies on marsupial proteins. II. Amino acid sequence of the β -chain of haemoglobin from the grey kangaroo, <i>Macropus giganteus</i> . By G. M. Air and E. O. P. Thompson	1437
Haemoglobins of the adult domestic fowl <i>Gallus domesticus</i> . By B. A. Moss and E. O. P. Thompson	1455
Correlation between bristle systems in <i>Drosophila melanogaster</i> . By L. P. Jones, R. Frankham, and A. K. Sheridan	1473
Genetic analyses of two abdominal bristle selection lines. By R. Frankham	1485
Relationships between resistance to <i>Boophilus microplus</i> , nutritional status, and blood composition in Shorthorn \times Hereford cattle. By J. C. O'Kelly and G. W. Seifert	1497
Relative value for wool growth and nitrogen retention of several proteins administered as abomasal supplements to sheep. By W. F. Colebrook and P. J. Reis	1507
The influence of the fluids from the genital tract of the ewe on the survival of ram spermatozoa. By B. J. Restall	1517

NUMBER 6, DECEMBER 1969 (*Continued*)

	PAGE
Freezing ram spermatozoa by the pellet method. I. The effect of diluent composition on survival of spermatozoa. By S. Salamon and R. J. Lightfoot	1527
Freezing ram spermatozoa by the pellet method. II. The effects of method of dilution, dilution rate, glycerol concentration, and duration of storage at 5°C prior to freezing on survival of spermatozoa. By R. J. Lightfoot and S. Salamon	1547
Freezing ram spermatozoa by the pellet method. III. The effects of pellet volume, composition of the thawing solution, and reconcentration of the thawed semen on survival of spermatozoa. By R. J. Lightfoot and S. Salamon	1561

Short Communications

P-protein-producing cells of the primary root of <i>Vicia faba</i> . By S.-Y. Zee ..	1573
Changes in rate of leakage of potassium from excised disks of apple fruits held at 20°C after harvest. By T. L. Lewis and D. Martin	1577
Transferrin polymorphism and population structure of the Weddell seal <i>Leptonychotes weddelli</i> (Lesson). By P. D. Shaughnessy	1581
Detoxification as a mechanism of resistance in a strain of the cattle tick <i>Boophilus microplus</i> (Canestrini) resistant to organophosphorus and carbamate compounds. By W. J. Roulston, C. A. Schuntner, H. J. Schnitzerling, and J. T. Wilson	1585
Index to Volume 22	1591