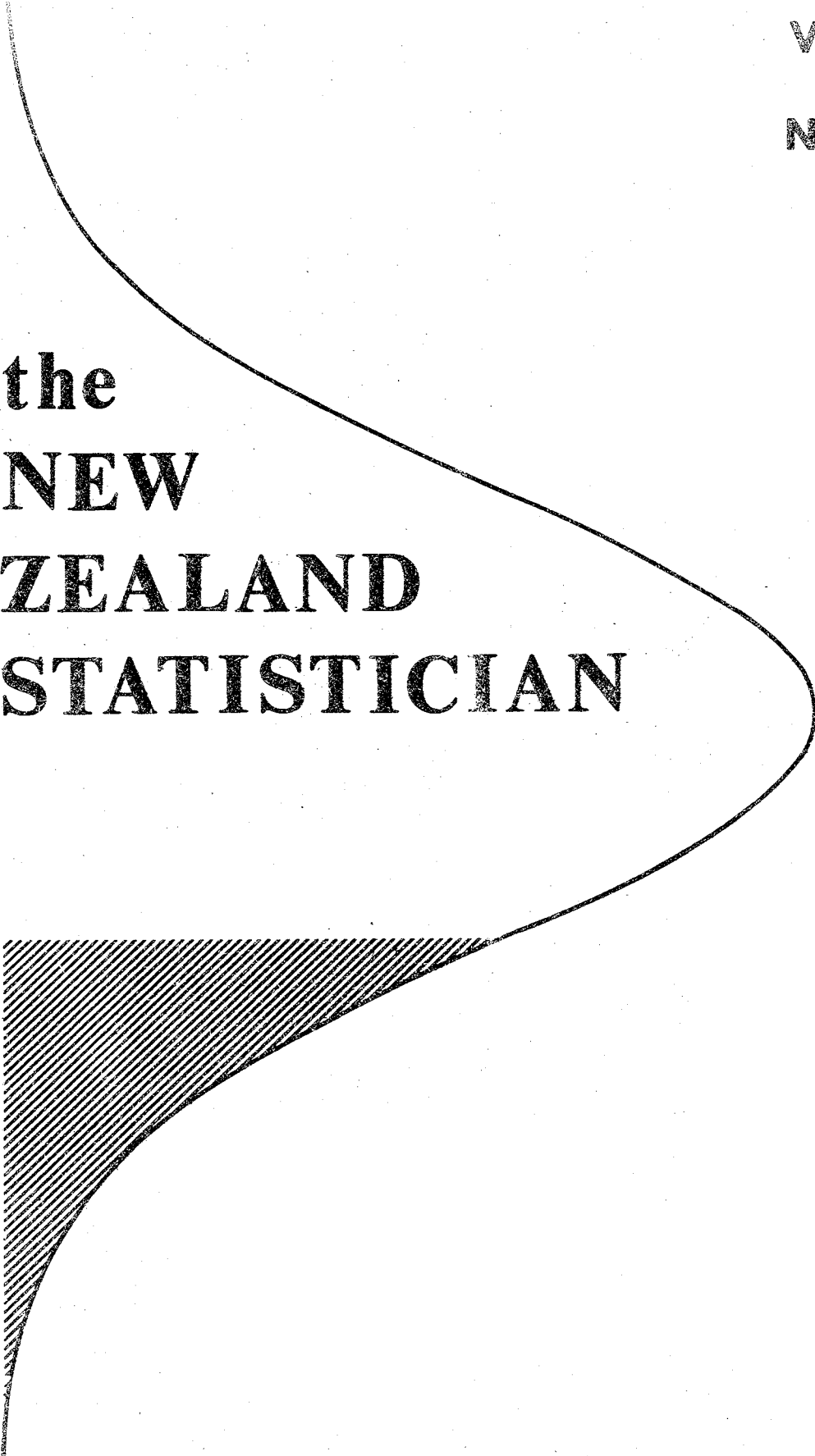


Volume 5

Number 1



**the
NEW
ZEALAND
STATISTICIAN**

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THE NEW ZEALAND STATISTICIAN

Published by the New Zealand Statistical Association, (Inc.)

Volume 5

June 1970

Number 1

THE NEW ZEALAND STATISTICAL ASSOCIATION (INCORPORATED)

Twenty-First Annual Conference

in conjunction with

THE OPERATIONAL RESEARCH SOCIETY OF NEW ZEALAND

to be held in the Shell Theatrette, The Terrace, Wellington

PROGRAMME:

Tuesday 30th June.

- 9.30 a.m. "Economising New Zealand's Statistical Resources"
- 11.00 a.m. "N.Z. Scientists, Nov. 1968; Salaries and Attitudes"
- 2.00 p.m. "Work of the Society for Research on Women in N.Z."
- 3.30 p.m. "Trends in Marriage in New Zealand"

Wednesday 1st July

- 9.00 a.m. "Distance Methods Used in Forest Sampling"
- 10.30 a.m. "Forecasting Private Import Payments by Distributed Lag Methods"
- 11.30 a.m. Annual General Meeting of the N.Z. Statistical Assn.
- 2.00 p.m. "Fitting models to non-stationary time series"
- 3.30 p.m. "Application of the Box-Jenkins Forecasting Theory"
- 5.00 p.m. Cocktail Party

Thursday 2nd July

9.00 a.m. "Solving the Paper Trim Problem by
Computer"
10.30 a.m. "The HOCUS Simulation Language and
Application"
2.00 p.m. "Risk Estimates in Project Evaluations"
3.30 p.m. "Civil Defence Casualties Estimation"

ACKNOWLEDGEMENT

The Executive Committee wish to record their appreciation of the generous gesture of the Shell Oil Company of New Zealand in allowing the Association the use of the Theatre for the Conference free of charge.

COMMITTEE

President S.S. Kuzmicich
Secretary-Treasurer H.S. Roberts
Executive Committee G.C. Arnold
E.A. Christianson (Corporate
Members
Representative)
B.I. Hayman
L.F. Jackson
H. Offenberger

Opening address by Mr P. J. Lewin, Government Statistician.

N.Z. SCIENTISTS, NOVEMBER 1968;
SALARIES AND ATTITUDES

A. H. Kirton,
Meat Section,
Ruakura Agricultural
Research Centre,
Hamilton.

The N.Z. Association of Scientists conducted a survey on the salaries and attitudes of scientists in 1968 from which 1,600 usable replies were received. The results showed that salaries increased with age; men were paid more than women; administrators were paid more than research workers or teachers; on an employer classification, industrial and university employed scientists were best paid; those with doctorates were better paid than those with lesser degrees; and scientists offered a job overseas were paid more than scientists who were not. Attitudes to technical facilities available and a rating of the scientists current job were included. In general, school teachers give the poorest ratings to their technical facilities.

There is no such thing as chance. A door may happen to fall shut, but this is not by chance. It is a conscious experience of the door, the door, the door, the door.

(From Lieschen by Kurt Schwitters)

(Taken from DADA: Art and Anti-Art, by Hans Richter: Thames and Hudson, 1965, p. 50)

WORK OF THE SOCIETY FOR RESEARCH ON WOMEN IN
NEW ZEALAND

Mrs M. K. Shields,
National President,
Society for Research
on Women,
Johnsonville.

Brief Outline of Society's Beginnings

- a. Short history of social research in New Zealand.
- b. Structure of the Society - use of consultants -
division of labour - separation of administration.

Main Projects

Main Urban Survey
Unmarried Mothers Study
Employers Attitude Study
Housing and Environment Study
Solo Parenthood Study.

Methods of Work - Stages in formulating - research
proposals - use of study groups - co-ordination -
differences between voluntary and paid professionals.

Future of Society - Main functions, statistical studies
and non-statistical studies, social policy research.

Improvements needed in Existing Statistical Services

General Summary of Society's Work and our View of
Potential Contribution to Social Research.

(Comment on Annual Conferences: Wellington members
come and go to individual papers, don't wear name
tags, and don't talk to members from outside
Wellington.)

TRENDS IN MARRIAGE IN NEW ZEALAND

Miriam Gilson,
Senior Lecturer,
Dept. of Social
Sciences,
Victoria University

This paper is a discussion of trends in age at marriage and the proportion of the population marrying in New Zealand over the past 80 years or so. It is a section of a more comprehensive study which aims to trace the effects of changes in demographic rates on family structure and the timing of the important stages of the family life cycle, and to offer some explanation of these trends. The eventual aim of the study is to contribute to an understanding of behavioural changes within the family circle and in the amount and type of participation of family members in the wider society. Changes in structure can never be a complete explanation of behavioural change; however they are important ingredients in the process, providing settings for behaviour which can reinforce or inhibit the effects of other changes.

DISTANCE METHODS USED IN FOREST SAMPLING

I. L. James,
Scientist,
N.Z. Forest Service,
Palmerston North.

This paper reports on a study of certain distance methods used in forest sampling. The purpose of the study is to simulate and characterise the spatial patterns found in forest stands, and then investigate the behaviour of the 'order' and 'nearest neighbour' distance sampling methods in these simulated forest stands. The study is essentially a progression of work reported to the Association last year by Mr L. Batcheler of the Forest and Range Experiment Station. It must be emphasised that it is by necessity a preliminary report of the study, mainly outlining the approach to the problem although it is hoped that some results will be completed for presentation.

FORECASTING PRIVATE IMPORT PAYMENTS
BY DISTRIBUTED LAG METHODS

D.J. O'Dea,
Senior Research
Officer,
Dept. of Statistics,
Wellington.

Econometric analysis commonly involves time-lagged variables. Their inclusion in a model, however, can lead to serious estimation problems caused by multi-collinearity and auto-correlation. A number of approaches have been developed to overcome these, usually on the lines that the effects of past events can be approximated by some simple mathematical curve, e.g. a decaying exponential.

In this paper an attempt to fit polynomials to such data by means of lagrangian interpolation is discussed. The data is from the monthly Survey of Overseas Orders and Payments conducted by the Department of Statistics. The general object is to construct a model relating future payments to past orders, with the intention of improving, if possible, the current fore-casts of private import payments.

ANNUAL GENERAL MEETING

- Agenda:
1. Apologies.
 2. Minutes of A.G.M. of 2nd July 1969.
 3. Arising from the minutes.
 4. Presidential Report.
 5. Financial Report.
 6. Election of Officers.
 7. General.

NEW ZEALAND STATISTICAL ASSOCIATION (INC.)

Receipts and Payments Account for year ended 31 March 1970

<u>Receipts</u>	(£)	<u>Payments</u>	(£)
Balance at 1.4.69	244.13	N.Z. Statistician Only Conference Copy	-
Subscriptions		Cocktail Party	
Ordinary	119.00	Speakers Tickets	5.00
Corporate	40.00	Conference	
	159.00	Catering	2.47
Cocktail Party		N.Z. Statistician	
Run by OR Society	-	V.4(1)	61.97
Conference		Donation (Shell)	10.00
Tea Money	6.70		74.44
OR Society	20.00	General	
	26.70	Stamps, Stationery, Misc.	25.95
Interest (Bank)	7.58	Balance at 31.3.70	
Miscellaneous	1.03	In Bank	330.47
	8.61	In Hand	2.58
			333.05
	<u>£438.44</u>		<u>£438.44</u>

Income and Expenditure Account for year ended 31 March 1970

<u>Expenditure</u>	(£)	<u>Income</u>	(£)
N.Z. Statistician	-	Subscriptions	159.00
Cocktail Party	5.00	Interest	7.58
Conference Loss	47.74	Miscellaneous	1.03
General	25.95		
Income for Year	88.92		
	<u>£167.61</u>		<u>£167.61</u>

Audited and found correct. N.A.O. Patchett, M. Com. A.R.A.N.Z.
(Honorary Auditor)

The association this year increased its bank balance by \$90 mainly because only one copy of the N.Z. Statistician (the Conference Copy) was published. Otherwise expenditure followed the usual pattern.

As an editor has now been appointed to the journal expenditure in the coming year will probably increase. However, there should be sufficient funds on hand for this and it is accordingly recommended that the subscription rates remain as at present - \$1.00 for ordinary membership, and \$8.00 for Corporate membership.

H. S. Roberts,
Secretary/Treasurer

All communications with regard to this journal or (hopefully) articles for publication should be sent to:

The Editor,
N.Z. Statistician,
P.O. Box 1500,
Wellington.

PRESIDENT'S REPORT

For the Year Ended 31 March 1970

Introduction

The rules of the Association lodged with the Registrar of Incorporated Societies state the aims and objects of the Association to be boldly "the encouragement of theoretical and applied statistics in New Zealand". During the year the Committee, like its predecessors, gave serious thought to the sustainable level and direction of Association activity to be aimed for, given the resources of the Association and the degree of member support.

I think the Committee made a genuine effort to lift the level of activity and not merely to carry on in the conventional manner, as I hope this report will indicate.

"Coming of Age" of the Association

The effective establishment of the Association took place in May 1949 and therefore, while legal incorporation did not occur until the following April, we can now look back on 21 years of de facto existence, a fact of some significance in the history of statistics in New Zealand.

Annual Conference in Wellington

Successive Committees have found that the prime sort of encouragement to statistics acceptable to members has been the holding of an Annual Conference which provides a forum for the interchange of statistical ideas. The geographical spread of the membership has resulted in Wellington being accepted as the best venue for this conference. The extensive range of statistical techniques and subject-areas applied in New Zealand over the last 20 years is indicated by a perusal of Conference programmes (Vol. 1 No. 1).

The successful 1969 Annual Conference, again held in association with a one-day conference of the Operational Research Society of New Zealand (which also assisted with the organization), was notable for the first-ever attendance

by a cabinet minister. The Minister in Charge of the Department of Statistics, and Minister of Finance, the Hon. R.D. Muldoon, opened the Conference with a paper on "Statistics at Cabinet Level". Another feature was the last of many papers presented to the Association by Mr J.V.T. Baker while serving as Government Statistician.

Possibility of a Residential Conference Away from Wellington

In line with views expressed at recent A.G.M's., the Committee during the year actively explored whether a residential conference with a high technical statistical content in the papers could be arranged and at some location where attendance would not be interrupted by normal day-to-day job responsibilities. This was envisaged as a supplement to the usual Wellington conference, not as a substitute.

A survey of members in the attempt to quantify likely support in terms of contributed papers and attendance was conducted late in 1969 and the results were sufficiently promising for the Committee to decide to proceed. Accordingly arrangements were made for a conference in Palmerston North, in May 1970 in association with the Mathematics Colloquium using the facilities at Massey University. Unfortunately only one offer of a paper was received and the notified attendance was so small that the conference had to be cancelled. It seems that at present actual member support does not warrant an extension to conference-type Association activity. The Committee's thanks are extended to Professor Hayman for the preparatory work which he did in connection with the proposed conference.

Membership

At 31 March 1970 the Association has 126 members, compared with 119 a year previously. Those unfinancial increased from 8 to 12 and of the 126 members, 16 joined during the reporting period. The corporate membership remained at nine.

Finance

As is indicated by the audited accounts submitted by the Secretary-Treasurer the Association's finances remain in a sound condition. The maintenance of small reserves as a base for expanded activity when this becomes a viable proposition seems to me to be a sound course.

"New Zealand Statistician"

During the year the Association's publication was not issued due principally to the unavoidable resignation of the editor, Mr W. A. Poole, when work commitments took him out of the country. I would offer the Association's thanks to Mr Poole for the sterling work he did in connection with the "New Zealand Statistician".

Recently, the Association has been fortunate in getting the services of Dr K.J.A. Revfeim to replace Mr Poole. The frequency of publication in the future, of course, depends on the support given to Dr Revfeim in the form of contributed copy.

National Development Conference

The Committee was interested during the year in the action of the National Development Council in setting up a Technical Committee on Statistics to review the extensions needed to New Zealand's official statistical system if the necessary quantitative information base was to be available as the framework for effective indicative economic and social planning. Important recommendations were made in the Committee's report, among others, on machinery for consultation with statisticians (and users of statistics outside of the official statistical system) when statistical developments are under way. In reply to a communication from the Association the Government Statistician has given assurances that the Association will be consulted, when appropriate, in line with the recommendations.

Sub-Committee on Statistical Education

The initiative of the Association leading to the introduction by the Technician's Certification Authority of a Certificate of Statistics training course will be known to members. However, much more needs to be done in the field of statistical education if the desirable appreciation by decision-makers, research workers and others of the potential value of statistical techniques of analysis is to be achieved in New Zealand. In recognition of this the Committee established during the year a standing committee on statistical education to further this aim. The relevant resolution of the Association's Committee reads:

"That a standing committee of Association members be set up, with power to coopt, for the purposes of promoting statistical education at all levels in New Zealand and to exercise a watching brief on developments in the educational field on behalf of the Association, the committee to have the delegated authority to act without specific approval of the Association's Committee, subject to general consultation with the President".

Mr J. Offenburger was appointed convenor and the other members are Professor Jowett and Mr Roberts. The future work of this committee will no doubt be discussed by members at the coming annual general meeting.

Appreciation

In conclusion I would like to express my thanks to the support given to me as President by Committee members. My special thanks to Mr Stan Roberts for his competent and conscientious work as Secretary-Treasurer.

Stephen Kuzmicich
President

FITTING MODELS TO NON-STATIONARY TIME SERIES

K.J.A. Revfeim,
Biometrics Section,
Dept. of Agriculture,
Wellington.

Most attempts to fit basic models to time series presume approximate stationarity of the series and a "large" number of observations. These requirements are often in conflict as most generating processes are subject to changing restraints or incentives, e.g. catalysts in chemical processes are usually being slowly poisoned. Thus in reality we are more likely to have a process where only a "small" number of the observations are approximately stationary and as well the series is liable to undergo discrete jumps, e.g. the effect of devaluation on certain economic series. This impulsive response can either be measured and subsequent observations adjusted or else its effect can be "smoothed" over the time of impulse.

The "small" number of observations available for analysis in the time domain is over-come by fitting models in the frequency domain using the evolutionary spectrum of the process. The spectrum will be defined and described before briefly discussing its estimation.

Using the spectrum we can fit the basic moving-average (MA), autoregressive (AR) and mixed AR/MA models estimating the model parameters at each instant of time. If the process is fortuitously stationary then the parameter estimates will reflect this. The result is to get a parallel series of parameter estimates using statistics reflecting the current structure of the series - an ideal situation for on-line process control and forecasting.

REMARKS ABOUT THE APPLICATION OF THE BOX-JENKINS
FORECASTING THEORY

P. König,
Applied Mathematics
Division,
D.S.I.R.,
Wellington.

Firstly the four basic steps of identification, fitting, diagnostic checking and forecasting will be explained with the notation used by the authors of the theory. Secondly the speaker will mention the programs available for application and thirdly a number of practical problems, which occur in carrying out the various steps, will be discussed using actual data for illustration.

SOLVING THE PAPER TRIM PROBLEM BY COMPUTER

D. Johanson,
New Zealand Forest
Products,
Kinleith.

Paper making machines produce paper in a continuous strip which must be cut into the lengths currently required by buyers. Traditionally the arrangement of the cut has been decided on the spot by the experienced men operating the knives that cut the paper. The aim is to minimise the trimmed waste that cannot be used.

Given the current paper requirements, it is possible to solve the combinatorial problem of combining the required rectangles to minimise trim losses using a computer programme. The talk will discuss the mathematical problem involved, and applications in New Zealand.

THE HOCUS SIMULATION LANGUAGE AND

APPLICATIONS

F. Coulter,
New Zealand Forest
Products,
Kinleith.

Hocus is a simple simulation procedure, developed in Britain, that can be carried out in many instances by hand computation. It has the advantages of simplicity of concept and simplicity of operation.

Mr Coulter will discuss the basic ideas of HOCUS and discuss some applications in the Forestry in New Zealand.

RISK ESTIMATES IN PROJECT EVALUATION

A.T.G. McArthur,
Senior Lecturer in
Rural Education,
Lincoln Agricultural
College.

Project evaluation has become an essential part of decision making. However in estimating the value of a project, it is usual to assume that it is possible to estimate with certainty the cash flows resulting from the adoption of the project. This assumption considerably limits the usefulness of project evaluation because in reality there is usually considerable risk associated with the estimation of cash flows.

This paper introduces a simplified procedure for estimating the variance of both the present and future value of a project. The simplicity of the method gives it a considerable practical advantage over other analytical methods which are available.

CIVIL DEFENCE CASUALTIES ESTIMATION

J.J. Hunter,
Lecturer in Mathematics,
University of Auckland.

An analytical model, developed by the speaker, enables rapid estimation of the total number of direct effects casualties due to a multiple nuclear weapon attack on a city. In the past evaluation of casualties was carried out by assessing small grids - a costly and time consuming procedure. By making minimal assumptions concerning the form of the population distribution we are able to approximate the actual population distribution of most cities. The only specifications required for the analytical model are the coordinates of the aiming points of the weapons in relation to the centre of the population, the population parameters, the weapon parameters and the aiming errors for each weapon. A description of the development of this model and its use by the Office of Civil Defence of the U.S. Department of the Army will be discussed.

Biographical Notes

Jeffrey J. Hunter, B.Sc.(N.Z.), M.Sc.(Hons)(Auckland), Ph.D (North Carolina) recently returned to New Zealand as a Lecturer in Mathematics at the University of Auckland. In 1964 he travelled to the U.S. on a Fulbright Travel Grant and pursued post graduate studies in the Department of Statistics at the University of North Carolina at Chapel Hill.

The research that he conducted while employed by the Operations Research and Economic Division of the Research Triangle Institute, during a summer vacation, serves as the basis of this talk.

The research for his doctoral dissertation ("On the renewal density matrix of a semi-Markov process") was sponsored by a U.S. Air Force Office of Scientific Research contract administered by the Statistics Research Division of the Research Triangle Institute. Following completion of his Ph.D in 1968, Dr Hunter spent nine months carrying out a programme of post-doctoral research as a Research Associate in the Department of Statistics of the University of North Carolina.

CASIO AL-1000 (REMINGTON-RAND)

H.S. Roberts,
Applied Mathematics
Division,
D.S.I.R.
Wellington.

REGISTER: 14 digits
READ OUT: Nixie
DIMENSIONS: 9" x 15" x 17"
WEIGHT: 10 Kg.

This is a programmable calculator, not a mini-computer, since no programmable decision making is possible. It may be used as an ordinary electronic calculator, or it may be programmed to simulate any desired electronic calculator, e.g. mean and standard deviation may be evaluated with only one button push for each number to be fed in.

DISPLAY REGISTER: 14 digits plus floating decimal point using Nixie tubes.

AUTOMATIC SQUARE ROOT: One button push.

MULTIPLICATION: Result may not contain more than 14 digits.

OPTIONAL ROUND OFF OR TRUNCATION: 0-8 digits following the decimal point.

MEMORY REGISTERS: Two of 14 digit capacity plus sign and decimal point. Two of 7 digit capacity plus decimal point.

These memory registers may be independently switched to serve either as temporary working storage, or as storage for constants or as accumulators to which the contents of the display register may be added or subtracted. Two button pushes are required to clear each memory register.

PROGRAM: One Program of up to 30 steps or two programs of up to 15 steps. Each operation key is allotted a number and programs are entered by setting a switch and pressing the numbers corresponding to the desired operations. (There are 14 different operations).

Neither program nor memory registers are affected by switching the machine on and off. The keyboard does NOT lock while an operation is in progress so that it is possible to operate the keys too fast without any warning being given.

The display lights are not very bright and reflections from lighting or windows make them difficult to read. Multiplication, division and square root all operate on positive numbers only, any minus signs present being ignored - this may reduce the suitability of the machine for scientific work.

Overflow and meaningless figures occur whenever a result exceeds 14 digits (i.e. multiply two 8 digit numbers together). NO WARNING INDICATION IS GIVEN. This is particularly serious when the Casio is being operating in program mode, since the calculations are done quite fast and the operator has no chance to check on the number of digits involved.

The number of keys has been reduced to a minimum, with the result that the effect of about a third of the keys depends on what keys have previously been pressed - this can create difficulties when learning to use the machine.

The instruction manual provided is INADEQUATE. It does not explain the exact effect of every combination of keys so that some surprising results can be accidentally obtained. Only the simplest programming examples are provided. No explicit details are given on how to make use of the two program capability, or even on how to actually run programs.

HARDWARE: Electronics composed of 10 circuit Boards, packing density fairly low, all discrete components. Keyboard ordinary contacts not reed switches, this could make for contact troubles. Power supply easily accessible. Memory easy to change should it be required. Fuse soldered in, making it inconvenient to change should it be required. Service Back up given.

SANYO ICC-162

H.S. Roberts

REGISTER: 16 Digits.
READ OUT: Mosaic
WEIGHT: 7.7Kgs
DIMENSIONS: 6" x 11" x 14 $\frac{1}{2}$ ".
FLOATING DECIMAL AND POSITIONING DECIMAL: for all points from 1 to 16.
AUTOMATIC SQUARE ROOT: One button push.
MULTIPLICATION: 8 digits x 8 digits.
POWER: 3 button pushes for each power.
CONSTANT MULTIPLICATION: One button push.
CONSTANT DIVISION: One button push.
CONSTANT DIVIDEND: Three button pushes.
CONTINUED MULTIPLICATION: Two button pushes.
SUMS OF SQUARES: Three button pushes for each number.
RC KEY: Recalls last two amounts entered. Thus allowing e.g. division and dividend to be exchanged.
OVERFLOW: High pitched sound, as well as light, occurs when overflow takes place.
DUPLEX: Good.
OPERATING LIGHT: Good (provided non-reflecting artists glass has been added).
HARDWARE: Nine plug in boards. Mixture of integrated and discrete circuits. Very accessible for servicing. Keyboard reed switches. Components will have to be specially imported.

TOSHIBA BC1623

H.S. Roberts

REGISTER: 16 digits
READ OUT: Nixie
WEIGHT: 5.5 Kg.
DIMENSIONS: 5½" x 12" x 14½"
AUTOMATIC DECIMAL: 0,1, 2, 3,4, 5, 6, 7, 8, 10, 12, 14 places.
AUTOMATIC SQUARE ROOT: One button push.
MULTIPLICATION: 15 digits by 16 digits. Complete answer given to 29 places, 16 digits in display register and remainder displayed by pressing Ex button.
POWERS: One button push.
CONSTANT MULTIPLIER: One button push.
CONSTANT DIVISOR: One button push.
CONSTANT DIVIDEND: Three button pushes.
CONTINUED MULTIPLICATION: One button push.
CONTINUED DIVISION: One button push.
SUMS OF SQUARES: Three button pushes for each number.
PERCENTAGE KEY: Automatically shifts decimal point two places.
EX KEY: Exchanges dividend and divisor but not with constant key depressed.
SHIFT KEY: Will shift a TOTAL to the right, one position at a time.
COUNT REGISTER: Displays the number of operations.
DISPLAY: Good.
OPERATING LIGHT: Good.
MISTAKE: 16 digits x 16 digits, gives zero or wrong answer and doesn't show overflow.
HARDWARE: Switchboard reed switches. Circuitry contained on plug in cords and is a mixture of discrete and integrated circuits. All covers have to be removed to get at the electronics. Printed circuits are of a high quality. The integrated circuits are not readily available in N.Z. at the present time and will have to be specially imported for local servicing.

TOSHIBA BC1623G

H.S. Roberts

REGISTER: 16 digits.
READ OUT: Nixie.
WEIGHT: 5.5 Kg.
DIMENSIONS: 5½" x 12" x 14½".

This is a programmable calculator, not a mini-computer, since no programmable decision making is possible. It may be used as an ordinary electronic calculator, or it may be programmed to simulate any desired electronic calculator, e.g. mean and standard deviation with 1 button push per number.

Apart from the addition of three extra buttons to control programming this is identical with the non-programmable Toshiba BC1623.

PROGRAM: 2 programs each of up to 15 steps may be used. There are two buttons to select which program is required and a third button to select recording mode or running mode. A program is entered into the machine by setting to record mode and then actually running through the required steps on the keyboard with arbitrary numbers. When actually running the program the machine accepts numbers from the keyboard wherever a number was entered while in the record mode. This method of program entry is quite simple and can be used by anyone who can operate the machine as a calculator.

Programs and memory registers are cleared when the machine is switched on. The square root of a negative number is given as minus the square root of the absolute value of the number, but the other operations handle signs correctly. Once a program has been entered there is no way of finding out what steps that program consists of.

The clear button does not operate as a program step and this restricts the utility of the + and - buttons within a program.

STATISTICS AT MASSEY UNIVERSITY

B.I. Hayman

The reasons for this article are two-fold. Firstly, it publicises activities at a new university which may be of interest to the members of this association. Secondly, as this university is the centre of extramural university teaching in New Zealand, members should be acquainted with the extramural statistics teaching available and should be encouraged to suggest what further extramural statistics courses at university level might be made available. (The N.Z. Certificate in Statistics at technical level has been publicised in this journal and was designed with considerable assistance from the members of this association).

Many aspects of Massey University have their origins in Massey Agricultural College which commenced teaching on the same site in 1928 and which was expanded in the early 1960's into a full university institution. Some statistics teaching has always been part of agricultural courses but it was not until 1951 that a formal Biometric course was initiated at the Agricultural College. This was taught on a part-time basis by the late Mr A.C. Glenday of Applied Mathematics Division, D.S.I.R., stationed at Grasslands Division near the College. Originally offered to fourth-year students, Biometrics was gradually brought forward to the second year in the Agricultural degree course. Some students wanted more than the Biometrics methods course and in 1963 an optional course, Statistics I, was introduced to provide a sounder foundation in statistical concepts for more advanced work. Statistics I was taught by members of the Agriculture and Horticulture faculty until 1965 when it was taken over by the recently formed Department of Mathematics.

In the environment of Massey University the development of mathematics followed a somewhat different pattern than that at the older universities. It was soon realised that a basic statistics course was of wide interest and in 1966 the Statistics I course was introduced to the Science degree as a paper of Applied Mathematics Intermediate and in 1967 to the Arts degree as a paper of Quantitative Mathematics I.

These were the first non-terminating first-year statistics courses for arts and science students in the country.

A parallel statistical development commenced in 1962 with the institution of the B. Tech. degree. Under the title of Quality Control Statistics an industry-oriented course was given as part of a second-year mathematics course. This has become part of a four-year programme of mathematics offered to B. Tech. students, the statistics section comprising, in the second year, basic statistics, in the third year, applications to quality control, and in the fourth year, operations research and other business techniques.

In the Arts and Science degrees a paper in statistics is now offered at each stage and students may major in this (usually combined with computer science) as an alternative to majoring in pure mathematics. In 1970 fourth year mathematics courses will commence for the degrees of B.Sc.(Hons.), M.Sc., M.A., and Dip. Sc. There are no compulsory papers in the fourth year and students may concentrate entirely on probability and statistics and computer science if they wish. The fourth-year papers available in 1970 will probably be -

Algebra	Automata Theory
Functional Analysis	Multivariate Analysis
Topological Analysis	Design and Analysis of
Mathematical Methods	Experiments
Computer Science	Advanced Mechanics
Numerical Analysis	Project
	Special Topic (up to two).

Students must select five papers for B.Sc.(Hons). For masterates in Arts and Science a second year's work on a thesis is required. For the Diploma in Science five of the above papers may be selected for the subject, Mathematics, while for the subject, Statistics and Computing, five papers must be selected from -

Design and Analysis of Experiments	Computer Science
Multivariate Analysis	Automata Theory
Finite Markov Chains	Project
Numerical Analysis	Special Topic
Mathematical Techniques of Operations Research	

The Department of Mathematics concentrates on the major statistics courses in the university. Considerable further instruction in statistics is given by staff of most faculties as part of various courses in the biological sciences, the social sciences and technology.

Massey University offers extramural courses to the whole country including Pure and Applied Mathematics at the first-year level. This year (1969) only the mechanics and statistics papers of Applied Mathematics are available extramurally. They will be withdrawn temporarily in 1970 and then in 1971 it is hoped to offer extramurally all three papers (mechanics, statistics and computer science) of Applied Mathematics for B.Sc., together with Quantitative Mathematics I (statistics and computer science) for B.A. or B. Com.

The Department of Mathematics also offers a parallel program in Computer Science which is commonly taken in conjunction with Statistics. It comprises a similar pattern of papers from stage I to honours in both the Arts and Science degrees together with a sequence in the B.Tech degree and a course in the fourth year of B.Agr.Sc.