

Malaysian Journal of Library & Information Science, Vol.7, no.1, July 2002: 43-56

ACKNOWLEDGEMENT PATTERNS IN RESEARCH ARTICLES: A BIBLIOMETRIC STUDY BASED ON *JOURNAL OF NATURAL RUBBER RESEARCH* 1986-1997*

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ABSTRACT

Analyses the acknowledgements included in the research articles and short communications published in Journal of Natural Rubber Research (1986-1997) in respect of types, frequency of occurrence, individuals acknowledged, etc. Results indicate that 74% items contain acknowledgements; an average acknowledgement per item is 2.2; the most common type of acknowledgments relates to technical support. Peer interactive communication accounts for 44% of the total acknowledgements. The result of the study substantiates the earlier findings that a small number of individuals are highly acknowledged and the rest are acknowledged infrequently.

Keywords: *Journal of Natural Rubber Research*; Rubber Research Institute of Malaysia; Acknowledgements; Natural Rubber; Bibliometrics; Informetrics; Scientometrics.

INTRODUCTION

The act of acknowledging or statement of indebtedness to others is a common practice to give due recognition to individuals or parties for the successful completion of a research article, book, thesis, project or experiment. Acknowledgements do give others a perception of the many contributions by others to the work completed and reflect a rich mix of personal, moral, instrumental, financial, technical and conceptual support received from institutions, agencies, co-workers, peers, family members, subjects and mentors (Cronin et al., 1993). In other words, the practice of acknowledgements in various types of documents does have certain social functions and cognitive significance. Nevertheless, its importance in bibliometric studies has been overlooked many times or neglected at times by bibliometricians who show more inclination to citation studies. However, there are a few studies on the practices, patterns and norms of acknowledgments and of its

* An expanded version of a paper presented at the 7th International Conference on Scientometrics and Informetrics, Colima, Mexico, 5-8 July, 1999.

Tiew, W.S. & Sen, B.K.

existence in the sphere of scholarly writings. One of the pioneers in the study of acknowledgements is Blaise Cronin, who, as a Professor of the School of Library and Information Science, Indiana University, Indiana, USA has conducted quite a few studies with his colleagues on acknowledgement and its importance in the field of bibliometric studies. Two studies conducted by Tiew (1998a, 1998b) also touched on the existence of acknowledgements in Malaysian learned journals, namely, *Journal of the Malaysian Branch of the Royal Asiatic Society* and *Journal of Natural Rubber Research*. This paper analyses acknowledgements appearing in *Journal of Natural Rubber Research*, and is based on an earlier bibliometric study (Tiew, 1998b).

LITERATURE REVIEW

As early as 1972, Mackintosh examined acknowledgements pattern in sociology in an unpublished dissertation. He argued that the lack of interest in acknowledgements does not necessarily indicate their irrelevance as rewards in science. For the study, a three-tier classification scheme was developed, viz., facilities, access to data and help of individuals to study acknowledgements in the *American Sociological Review*.

In trying to analyse acknowledgement styles in ethnography Ben-Ari (1987) found out that anthropologists tend to go for richly textured expressions of gratitude to their mentors, family, and friends. Ben-Ari further argued that acknowledgement is akin to synopses, tables of contents, indexes or lists of graphs and illustrations. Ben-Ari's study was based on analysis of approximately 200 ethnographical studies and on discussions with British and North American anthropologists.

McCain (1991) conducted a study using the acknowledgement section of 241 experimental papers published in the 1988 volume *Genetics*. To aid her study, she developed a five-part classification scheme independently to categorise the collected acknowledgements, namely, access to research-related information, access to unpublished results or data, peer interactive communication, technical assistance and manuscript preparation.

In the same year, Cronin (1991) explored the social functions and the cognitive significance of acknowledgements figured in *Journal of the American Society for Information Science (JASIS)* for the years 1970-1990. Not knowing the existence of the typologies developed by Mackintosh and McCain, a six-category typology was developed by Cronin (Table 1) and applied to 444 acknowledgements, which were carried by research articles in *JASIS* 1970-1990. For naming each type, he used jargons like Prime mover, Paymaster, and Dogsboddy. Later on the jargons were replaced with more easily understandable terms as indicated in Table 1. He concluded that historically the bibliometrics research community has ignored acknowledgements but its very importance as compared to citations cannot be

Acknowledgement Patterns in Research Articles: a Bibliometric Study

overlooked. He further proposed that acknowledgements and citations should be used conjointly in the assessment of research performance and in disciplinary exegesis. This is because acknowledgement data is also an indicator of the importance of an individual in his own field.

Table 1: Typologies of Acknowledgements

MacKintosh 1972	Cronin 1991	McCain 1991	Cronin, McKenzie & Rubio 1993	Tiew & Sen 1999
Access to data		Access to research-related information Access to unpublished results or data	Access	Access
	Trusted assessor	Peer interactive communication	Peer interactive communication	Peer interactive communication
Help of individuals	Moral support		Moral support	Moral support
	Technical	Technical assistance	Technical support	Technical support
	Dogsbody @	Manuscript preparation	Clerical support	Clerical support
	Paymaster		Financial support	Financial support
Facilities	Prime mover*			Unclassifiable

@ - "Secretarial support, editorial and presentational guidance, assistance with routine data capture, entry and analysis" (Cronin 1991)

* - "Inspiration or drive provided by principal investigator, project director, dissertation adviser, mentor, guru" (Cronin 1991)

Cronin, McKenzie and Stiffler (1992) carried out an analysis of acknowledgements in four library and information science journals, namely, *Library Quarterly*, *Journal of Documentation*, *Information Processing & Management*, and *College & Research Libraries* covering a period of 20 years, (1971-1990). It was found that a small number of individuals are highly acknowledged, and a majority is mentioned infrequently. The concentration is similar to that found in the citation analyses of research productivity. There is also a positive rank order correlation between frequency of acknowledgement and citation frequency.

In another study, Cronin, McKenzie and Rubio (1993) investigated the scale and nature of acknowledgement behaviour in four academic disciplines; history, philosophy, psychology and sociology covering a twenty-five year period. Using a modified version of the typology developed by Cronin in an earlier study (Table 1),

Tiew, W.S. & Sen, B.K.

more than 5,600 acknowledgements were classified. Cross-disciplinary similarities and differences were observed and highly acknowledged individuals for each discipline were also identified. The frequency distributions of acknowledgements exhibited high levels of concentration and the authors' acknowledgement behaviours were highly consistent.

Cronin et al. (1993) analysed the scale and significance of acknowledgement behavior in ten top-ranking sociology journals over a 10-year period. It was found that almost three quarters of all articles included an acknowledgement statement; more than half included an acknowledgement attesting to peer interactive communication; 5000 individuals were explicitly acknowledged but only a few were highly acknowledged. No correlation between frequency of acknowledgement and frequency of citation was found.

Davis and Cronin (1993) examined those acknowledgements that suggest significant intellectual indebtedness, and proposed a mathematical model that matches empirical data closely. The use of Kolmogorov-Smirnov two-sample test to elucidate citation patterns shows promise for estimating individual's influence in a field and hence assists in determining cognitive interdependence among disciplines.

Cronin and Weaver-Wozniak (1993, 1995) reviewed the scale, range and consistency of acknowledgement behaviour in citations for a number of academic disciplines. The studies indicate that the practice of acknowledgement in scholarly communication is widespread and growing. Hence, the authors explored the relationship between authorship, acknowledgements and citations and considered the case for using as indicators in academic performance assessment. They proposed the development of an online acknowledgement index as a sister product to the citation index. The qualitative and quantitative evidence suggest a pervasive and consistent practice in which acknowledgments define a variety of social, cognitive and instrumental relationships between scholars and within and across disciplines. Hence, they may be used alongside other bibliometric indicators to map networks of influence.

Cronin and Overfelt (1994) conducted a survey involving major US research universities to explore the normative bases of acknowledgement behavior. Measures of agreement and divergence were established in respect of five issue sets pertaining to acknowledgement practice: expectations, etiquette, ethics, equity and evaluation. The results confirm the substantive role played by acknowledgements in the primary communication process. It was argued that acknowledgement data could be mined to lay bare the rules of engagement that define the dynamics of collaboration and interdependence among scholars.

Acknowledgement Patterns in Research Articles: a Bibliometric Study

Tiew (1998a) in his MLIS dissertation found out that the practice of acknowledgements among contributors to *Journal of the Malaysian Branch of the Royal Asiatic Society* is not very substantial. Only 36% articles contained formal acknowledgements. In another study on *Journal of Natural Rubber Research* (1998b), Tiew explored the extent of acknowledgements being included in research articles and short communications. The results indicate that of the 258 articles, 193 (75%) research articles and short communications contained acknowledgements.

The above literature shows that the study of acknowledgements is gaining ground especially in the United States. However, in this part of the world, Malaysia and Southeast Asia, this type of study is still in its infancy. This study therefore, is an attempt to add to the literature on the topic and generate interest among others to carry out similar studies. Moreover, studies on acknowledgements can be used as a yardstick to indicate the status of authorship among authors and support claims to scholarly contribution.

SCOPE

The present study attempts to examine the acknowledgements included in 301 research papers and nine short communications in the *Journal of Natural Rubber Research* during 1986-1997. It should be noted that this journal started in 1929 is one of the oldest and established scientific journals published from Malaysia. It is a renowned journal in the field of natural rubber research. Of the 310 articles and short communications identified for the study, 230 (74.2%) contain acknowledgement of some kind. To aid the classification of acknowledgements, the Cronin-McKenzie-Rubio typology has been used. Certain acknowledge-ments such as 'assistance of [some individuals] is acknowledged'; 'the author would like to thank [some individuals or institutions]'; 'the research programme was performed with assistance from [some institutes]; etc. could not be classified according to Cronin-McKenzie-Rubio scheme and they have been categorized as unclassifiable.

OBJECTIVES

The present study aims to analyse the acknowledgements to determine the frequency of their occurrence, types, number of acknowledgements per paper; highly acknowledged individuals, and so on.

METHODOLOGY

All the research articles and short communications published in the journal between 1986-1997 were scanned through to locate the acknowledgements. These acknowledgements were then examined, classified and analyzed from various angles and results thereof were tabulated.

More often than not, the acknowledgements section of the article indicated more than one acknowledgement. Hence, the number of acknowledgements per article is counted and multiple acknowledgements of the same category in an article were considered as one. Apart from that, names of individuals acknowledged in peer interactive communication (PIC) type acknowledgements were noted down for further analysis to identify highly acknowledged individuals in the field of natural rubber research. Finally, institutional affiliations of the individuals acknowledged were also checked and verified using the annual reports and other relevant materials available at the Rubber Research Institute of Malaya (RRIM) Library.

RESULTS AND DISCUSSION

(a) Acknowledgements in the *Journal of Natural Rubber Research*

Table 2 reveals that the practice of acknowledgements in research articles and short communications is quite common in this journal. Out of 310 articles, 230 (74%) contain formal acknowledgements. The maximum number of articles (83%) contained acknowledgements in 1987, and minimum number (58%) in 1997.

Table 2: Acknowledgements appearing in the Journal

Year	Number of Articles	Number of Articles With Acknowledgements	Percentage
1986	28	23	82
1987	24	20	83
1988	27	20	74
1989	27	21	78
1990	27	20	74
1991	26	21	81
1992	24	15	63
1993	29	21	72
1994	28	20	71
1995	23	17	74
1996	23	18	78
1997	24	14	58
Total	310	230	74

(b) Frequency Distribution of Acknowledgements

Table 3 reports the frequency distribution of acknowledgements. The highest number of acknowledgements per article (2.5) is found in 1991, 1992 and 1996 and the lowest in 1997 (1.8 per item). On an average, each article contained 2.2 acknowledgements.

Acknowledgement Patterns in Research Articles: a Bibliometric Study

Table 3: Acknowledgements per Article

Year	Number of Articles with Acknowledgements	Number of Acknowledgements in Articles	Mean
1986	23	49	2.1
1987	20	45	2.2
1988	20	40	2.0
1989	21	42	2.0
1990	20	43	2.1
1991	21	53	2.5
1992	15	38	2.5
1993	21	50	2.4
1994	20	47	2.3
1995	17	33	1.9
1996	18	45	2.5
1997	14	25	1.8
Total	230	510	2.2

(c) Acknowledgements by Category

Table 4 shows the acknowledgements by categories. The largest number of acknowledgements is in the technical category (26%), followed by PIC category (20%), access to facilities (15%), moral support (13%), financial support (12%), and clerical support (7%). About 7% of the acknowledgements could not be classified due to lack of clear-cut information.

Table 4: Categories of Acknowledgements

Year	Moral Support	Financial Support	Access	Clerical Support	Technical Support	PIC	Unclassified	Total
1986	5	7	10	1	13	10	3	49
1987	5	4	5	4	13	11	3	45
1988	4	6	7	4	12	5	2	40
1989	4	4	3	6	11	9	5	42
1990	6	1	8	5	9	10	4	43
1991	11	6	7	5	14	10	-	53
1992	5	1	7	4	11	8	2	38
1993	7	9	6	3	14	8	3	50
1994	7	7	9	-	12	7	5	47
1995	3	5	6	1	8	7	3	33
1996	9	7	4	2	10	11	2	45
1997	3	6	3	-	5	5	3	25
Total	69	63	75	35	132	101	35	510
%	13	12	15	7	26	20	7	100

(d) PIC Acknowledgements

Table 5 shows the distribution of PIC acknowledgements. The highest number of PIC acknowledgements (61%) is seen in 1996 while the lowest number (25%) in 1988, and the mean is 44%. This figure is not too low as compared to *Journal of*

Documentation (56.5%), *Journal of American Society of Information Science* (54.9%), *Information Processing & Management* (49.5%), and *College & Research Libraries* (46.2%). However, it is higher than *The Library Quarterly* (42.6%). When compared to four humanities and social sciences journals, namely *Psychology Review* (78.1%), *American Sociology Review* (92.6%), *American Historical Review* (83.7%) and *Mind* (95.5%), (Cronin, McKenzie & Rubio, 1993) the number of PIC acknowledgements in rubber research is found to be rather low.

Table 5: PIC Acknowledgements

Year	Articles with Acknowledgement	Number of PIC Acknowledgements	%
1986	23	10	43
1987	20	11	55
1988	20	5	25
1989	21	9	43
1990	20	10	50
1991	21	10	48
1992	15	8	53
1993	21	8	38
1994	20	7	35
1995	17	7	41
1996	18	11	61
1997	14	5	36
Total	230	101	44

(e) Number of Acknowledgements per Individual

Table 6 shows the number of acknowledgements per individual. Out of 80 individuals acknowledged, only one has been mentioned fifteen times while the rest between eight and one time only. The result depicts some similarities with earlier studies which indicate the tendency for a small number of names to receive multiple mentions while the majority receive one or two mentions only (Cronin, 1991; Cronin, McKenzie & Stiffler, 1992; Cronin, McKenzie & Rubio, 1993; Cronin, McKenzie, Rubio & Weaver-Wozniak, 1993).

Table 6: Number of Acknowledgements per Individual

No. of Times Acknowledged	1	2	3	4	5	6	8	15
No. of individuals	53	12	4	4	2	2	2	1

(f) Individuals Acknowledged Two Times or More in PIC Acknowledgements

In all, twenty-seven individuals have been acknowledged two times or more (Table 7). Topping the list is A. Subramaniam who is affiliated with RRIM with fifteen mentions, followed by K. N. G. Fuller of Malaysian Rubber Producers' Research Association (MRPRA) and Yoon Pooi Kong of RRIM with eight mentions each.

Acknowledgement Patterns in Research Articles: a Bibliometric Study

The other 24 individuals received between six and two mentions only. A further study of the institutional affiliation of the 27 individuals indicated that 15 of them were affiliated with RRIM, 10 affiliated with MRPRA, while two others were academicians, affiliated with agricultural universities. Hence, it can be deduced that the staff of both RRIM and MRPRA, very closely associated with the rubber industry do play an important role in the growth of rubber research activities as reflected in the journal under study.

Table 7: Individuals acknowledged two times or more

Names	Acknowledgement Score
Subramaniam, A.	15
Fuller, K. N. G.	8
Yoon, Pooi Kong	8
Campbell, D. S.	6
Mahmud Abdul Wahab	6
Abu Talib Bachik	5
Lai, Pin Fah	5
Abdul Kadir Mohamed	4
Muhr, A.H.	4
Schallamach, A.	4
Yeang, Hoong Yeet	4
Audley, B. G.	3
John, C. K.	3
Ong, Eng Long	3
Zahar Samsuddin	3
Ismail Hashim	2
Iyer, G. C.	2
Leong, Yit San	2
Lewis, Peter	2
Morris, M. D.	2
Porter, M	2
Roberts, A.D.	2
Simmonds, N.W.	2
Tan, Hong	2
Tanaka, Y	2
Tinker, A.J.	2
Webster, C.C.	2

SUMMARY

The findings of the study can be summarised as below:

- The practice of acknowledgement in natural rubber research communications is found to be quite common considering that 74% communications included acknowledgements.
- The average acknowledgement per research communication is 2.2, which indicates the composite nature of the acknowledgements.

Tiew, W.S. & Sen, B.K.

- The most common type of acknowledgement found is of the technical type accounting for about 26% of the total.
- The number of PIC acknowledgements accounts for 44% of the total acknowledgements, which is more or less at par with those found in LIS journals, where PIC acknowledgements range from 42.6% to 56.5%. However, it is low compared to those found in humanities and social science journals, where PIC acknowledgements range from 78.1% to 95.5%.
- Only one individual (A. Subramaniam of RRIM) received a total of 15 mentions in the acknowledgements. Only a few individuals have been acknowledged several times. The finding is in agreement with other studies conducted earlier.

A further study of the institutional affiliation of the highly acknowledged names show that RRIM tops the list indicating its very active role in the peer interactive communication process. It is hoped that further studies can be carried out to explore the extent of acknowledgement phenomena in the various fields other than rubber in Malaysia.

ACKNOWLEDGEMENT

The authors are thankful to Puan Rabiah bte Mohd. Yusof, Librarian, RRIM and her staff; and also to Prof. Madya Dr Siti Salwah Salim, Dean, Faculty of Computer Science and Information Technology, University of Malaya, for providing the necessary facilities for the preparation of the paper.

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APPENDIX 1

EXAMPLES OF ACKNOWLEDGEMENT CATEGORIES

Moral Support

- a. 'The authors would also like to thank the Board of the Tun Abdul Razak Research Center for permission to publish this work.' (v11,n4,1996,p.238)
- b. 'Acknowledgements is also due to the Research Review Committee and the Ethical Committee of the Malaysian Ministry of Health for granting their official approval for this study.' (v11,n4,1996,p.245)
- c. 'He would like to thank the support and interest of Dr. P. K. Yoon and Dr. Ho Chai Yee.' (v10,n1,1995,p.74)
- d. 'We thank Dr. P. K. Yoon, Head of Plant Science Division, RRIM for his sustained support and encouragement in this study.' (v8,n3,1993,p.230)
- e. 'The authors are thankful to the Director, RRIM for his support of this research project.' (v6,n2,1991,p.125)

Financial Support

- a. 'The authors wish to thank IRPA for research grant (no. 1-03-05-020).' (v12,n1,1997,p.65)
- b. 'This work was supported partly by a grant of the Ministry of Health and Welfare, Japan.' (v12,n2,1995, p.105)
- c. 'The first author would like to thank the Director of RRIM for his secondment to the MRPRA, Brickendonbury, UK where this study was undertaken.' (v9,n4,1994,p.225)
- d. 'This study was supported by the National Science Foundation of China.' (v8,n2,1993,p.145)
- e. 'The Universiti Sains Malaysia is thanked for the award of the short-term grant which made this study possible.' (v3,n4,1988,p.282)

Access

- a. 'The authors are thankful to Nor Asiah Abd. Aziz of Latex Technology Division for the information on rubber glove production. (v12,n3,1997,p.185)
- b. 'The author wishes to convey his sincere appreciation to ... and also for road trials and testings on bituminous and rubberised bituminous mixes at the Pavement Laboratory of IKRAM.' (v11,n3,1996,p.182)
- c. 'The authors thank Dr. J. L. Jacob of CIRAD, Montpellier for kindly providing lutoids.' (v10,n1,1995,p.43)
- d. 'We thank Revertex Malaysia Sdn. Bhd. for a gift of prevulcanised latex concentrate.' (v10,n1,1995,p.61)
- e. 'The author would like to thank ... and Nivis Tyre AB Sweden for the manufacture of the tyres for ice traction testing.' (v9,n3,1994,p.154)

Clerical Support

- a. 'Thanks are due to Low Boon Hoi and A. Parameswari for their excellent work in extracting and tabulating field work.' (v11,n2,1996,p.106)
- b. 'K. M. Wong, responsible for recording work and Lily Sharinawaty Haron, for typing the manuscript are also thanked.' (v11,n4,1996,p.289)

Acknowledgement Patterns in Research Articles: a Bibliometric Study

- c. 'We are grateful to Messrs. David Muthiah, R. Nagendren and N. Pushpamalar for assistance in assembling some of the data.' (v7,n4,1992,p.301)
- d. 'The authors thank ... and Mr. Lee Yat Hoong, Mrs. Jeyanayagi and Mr. Loo Tee Fan for graphic and manuscript preparation.' (v7,n3,1992,p.204)
- e. 'Thanks are also due to ... and Puan Lilian Yee Sing Mooi for the preparation and typing of the manuscript.' (v7,n1,1992,p.82)

Technical Support

- a. 'Excellent technical assistance of Shahrom Abdullah, M. Veerapan and Haron Hashim is gratefully acknowledged.' (v12,n1,1997,p.56)
- b. 'I am grateful to Prof. Leynadier and Dr. M. H. Chabane of the Hopital Rothschild, Paris for the skin-prick tests.' (v12,n4,1997,p.233)
- c. 'The authors would like to thank Chin Kam Hong for data processing and Hamid Othman for establishing and management of the screening nursery.' (v11,n2,1996,p.113)
- d. 'The invaluable help in statistical analysis by Y. H. Phoon and staff of the Statistical Unit, RRIM is also gratefully acknowledged.' (v11,n4,1996,p.289)
- e. 'Mr. Lee Yat Hoong and Mr. Tsan Fan Kui are also thanked for their assistance in photography.' (v9,n4,1994,p.187)

Peer Interactive Communication (PIC)

- a. 'Thanks are due to Dr. D. Campbell and Mr. P. Lewis for helpful discussion of chemical reactions.' (v12,n1,1997,p.10)
- b. 'We also thank Dr. H. Y. Yeang for reading the manuscripts and suggestions given.' (v11,n2,1996,p.123)
- c. 'The authors wish to thank P. S. Brown who provided invaluable advice.' (v11,n3,1996,p.147)
- d. 'Acknowledgements are made to Dr. C. Y. Ho (former leader of Breeding and Selection Group) and P. K. Yoon (former Head of Plant and Science Division) for initiation and support of this ortet selection programme.' (v11,n3,1996,p.225)
- e. 'We also wish to express our thanks to Prof. Nam-hai Chua, Rockefeller University, New York, USA for his guidance.' (v9,n4,1994,p.287)

Unclassified

- a. 'Assistance of Rosli Bachik, Yoon Kwai Fong, K. Krishnan, Jeyanayagi and Haron Hashim are greatly appreciated.' (v12,n1,1997,p.65)
- b. 'She also likes to acknowledge the very capable assistance of R. Vijalakshmi, Ng Chong Seng and Abd. Aziz Awang. Contribution by Mok Kok Lang during the initial stage of the study.' (v12,n3,1997,p.173)
- c. 'We also appreciate the collaboration of the University of Sdney Electron Microscope Unit and of Olga Schaffer of Lehigh University.' (v12,n4,1997,p.230)
- d. 'The author would like to thank Dr. H. Hasma and Yusoff Rais of the Latex Technology Division, RRIM for their assistance' (v11,n3,1993,p.198)
- e. 'This research programme was performed with assistance from the Centre de Cooperation Internationale en Recherche Agronomique pour le Developpment – Cultures Perennes (CIRAD-CP).' (v10,n4,1995,p.240).

APPENDIX 2
LIST OF NAMES ACKNOWLEDGED IN
PIC ACKNOWLEDGEMENTS,
Journal of Natural Rubber Research,
1986-1997

1. Ab. Latif
2. Abdul Kadir Mohamed
3. Abdul Madjid
4. Abu Talib Bachik
5. Ahmad Ibrahim
6. Allen, P. W.
7. Audley, B. G.
8. Berthold, D. A.
9. Bristow, G. M.
10. Brown, P. S.
11. Campbell, D. S.
12. Chan, Heun Yin
13. Chee Kheng Hoy
14. Chin, Hong Cheaw
15. Chow, Chee Sing
16. Chua, Nam-hai
17. Cordon, Max
18. Courtneidge, J. L.
19. D'Auzac, J.
20. Davies, R. T.
21. Dekker, J.
22. Forsyth, Peter
23. Fuller, K. N. G.
24. Gan, E. H.
25. Gate, M. D.
26. Gelling, I. R.
27. Gomez, J. B.
28. Halasa, A. F.
29. Hasma Hashim
30. Ho, C. K.
31. Ismail Hashim
32. Iyer, G. C.
33. John, C. K.
34. Lai, Pin Fah
35. Lake, Graham
36. Lau, Chee Heng
37. Leong, Yit San
38. Lewis, Peter
39. Lim, Sow Ching
40. Loo, Cheng Teik
41. Mahmud Abdul Wahab
42. Mohd. Hisam
43. Morris, M. D.
44. Muhr, A. H.
45. Na-Ranong, N.
46. Norhayati Moris
47. Ong, Eng Long
48. Ottewill, R. H.
49. Patterson, Lindsay
50. Porter, M.
51. Radziah Nom Zainuddin
52. Roberts, A. D.
53. Schallamach, A.
54. See Toh, Mook Sang
55. Sidek Dulngali
56. Simmonds, N. W.
57. Spoor, W.
58. Stevenson, A.
59. Subramaniam, A.
60. Swaminathan, M. S.
61. Tan, Ah Moy
62. Tan, Hong
63. Tanaka, Y.
64. Teoh, Kim San
65. Thomas, A. G.
66. Thomas, Alan
67. Thudium, R. N.
68. Tinker, A. J.
69. Verhe, R.
70. Wan Abdul Rahman Wan Yaacob
71. Warren, G. P.
72. Wastie, R. L.
73. Webster, C. C.
74. Wong, Chaw Bin
75. Wong, Niap Poh
76. Yap, Thoo Chai
77. Yeang, Hoong Yeet
78. Yoon, Pooi Kong
79. Yusoff Rais
80. Zahar Samsuddin