# A Tribute to the Research Work of Dr. Glendon Lean

Alan J. Bishop
*Faculty of Education, Monash University*
<Alan.Bishop@education.monash.edu.au>

Glendon Lean was a valued member of the Faculty of Education, Deakin University, Geelong, from 1989 to 1995. Glen's father, Joe Lean, bequeathed to the University money to establish the Glendon Lean Scholarship as a permanent memorial to Glen. This perpetual scholarship place will be for research in mathematics education at the doctoral level. Alan Bishop agreed to write the following tribute.      Judy Mousley

I am delighted to have the opportunity to pay tribute to the work of a highly valued colleague who is sadly no longer with us—Glendon Lean—but whose work and spirit lives on through the bequest to Deakin University.

Glendon spent from 1968 to 1989 working at the Papua New Guinea University of Technology, in Lae, PNG, and then came to an appointment at Deakin University until the time of his death in 1995. He excelled in so many things: he was a gifted teacher, a true academic, a bibliophile, a gourmet and chef, a marvellous raconteur and party host, and from the perspective of his mathematics education work, a dedicated ethno-mathematical anthropologist.

I was fortunate to know Glendon over a period of about 20 years. He first visited me in Cambridge in 1976 on his round-the-world OSP trip to find out all he could about new developments in geometry teaching, which he said was a great problem at Unitech. After a great day of discussion, he said "If you are ever in PNG look me up!" I said that was highly unlikely, but then realised I had a year of OSP due to me, so I replied that it might not be such a silly idea after all. Eventually, with my wife and 2 small sons, I was able to go to PNG for a memorable 3 months to work with Glendon. Subsequently he came to do an MPhil degree with me at Cambridge, and then I became his supervisor for his PhD which he did through Unitech. Of course we became great friends.

In this brief tribute I would like to illustrate his great contribution to us today, with a few extracts from his thesis. Over the period of 21 years in PNG, he read avidly about linguistics and about the many languages of Papua New Guinea, interviewed students and informants from all over the country, travelled PNG extensively, learnt and spoke several of the languages, and personally collected and documented details of the more than 1,500 counting systems there. His PhD thesis is called "Counting systems of Papua New Guinea and Oceania" and in it he documents over 2000 different counting systems in four book-sized appendices. It is a monumental work and one which not only contributes hugely to humankind's store of mathematical knowledge, but which also demonstrates what anthropology can offer those of us who work in the field of mathematics education.

This is what the abstract of Glendon's thesis says:

There are 1200 languages spoken in the region which encompasses Papua New Guinea, Irian Jaya, the Solomon Islands, Vanuatu, New Caledonia, Polynesia, and Micronesia. This study is based on data collected over twenty years on the natural language numerals of 883 of these languages and which are provided in four volumes of appendices. The various counting systems and tallies may be classified and distinguished according to their cyclic structures. We provide here for the first time a comprehensive survey of the geographical distribution of these throughout the region as well as their distribution according to the linguistic classification applied to the Papuan and Austronesian

language groups. By using a number of brief counting ethnographies we investigate several aspects of counting and number in a sample of societies and which include the importance accorded to counting, what sort of objects are counted, the existence and nature of numeral classification, and the existence of terms for large numbers. Of more theoretical interest, however, this study also addresses the question of the validity of the diffusionist view of how and when the counting system situation in the region came to be established, a view which still holds sway in the current literature of the field. I propose instead an alternative view of the prehistory of number which sees the locus of the origins of counting in ancient indigenous societies rather than in the relatively recent agricultural city-states of the Middle East.

So, one result of his research is the most extensive data-base of Papua New Guinea and Oceania counting systems ever produced, and probably the more extensive data-base of counting systems produced anywhere. Not bad for a PhD!

Just to see the dedication with which Glendon approached his research work, here are some details about his research approach:

> The primary sources are divided into four main groups. The first group comprises my field notes which were taken in two different set of circumstances. There are those field notes taken from informants living in villages which I visited. One-to-one interviews were held, wherever possible, with an older member of the village, usually, though not always, male. From my first field trip in 1968 to my last in 1987, I have records of interviews with informants from 35 villages in eight provinces.

> The second set of circumstances in which I acquired field notes was when informants, particularly those living in relatively remote areas, visited Lae and I was able to arrange an interview with them. I have records of 29 interviews which fall into this category.

> The second main group of primary sources, which in fact forms the major part of my complete data-base for PNG, comprises questionnaires given to three different populations. First, there are those completed by incoming students at the University of Technology during the period 1968 to 1983; these account for a total of 1200. Second, students at four National High Schools completed questionnaires in 1982, 1984, and 1986; these account for a further 1022. Third, in 1985, copies of a slightly revised questionnaire were sent to headmasters of 1700 Community (primary) Schools in all provinces of PNG. In each case the headmaster was asked to assist in the completion of the questionnaire with an adult who spoke the local vernacular (in general, a single community school serves a single language group). These account for an additional 302, giving altogether a total of 2524 useable, completed questionnaires.

> The third group of primary sources comprises unpublished material gathered during the *Indigenous Mathematics Project* (IMP) during the period 1976 to 1979. Altogether a total of 238 IMP questionnaires were made available for this study.

> The fourth group of unpublished primary source material derives from survey word lists compiled by members of the Summer Institute of Linguistics. A complete search of these materials in the period 1984 to 1986 yielded a total of 362 Word Lists which contained some numeral data on various languages spoken in each of the PNG provinces.

The questionnaire technique which Glen used with the students is not a common one amongst anthropologists. It could be looked upon critically in that in some cases it may have produced rather sketchy information from one informant. On the other hand it was a technique which enabled him to cover the wide range of languages in contexts which are found in that country. For example, he says:

> I have been unable to find a single instance of a language which has only the numerals 1 and 2 and which terminates precise enumeration at 2,

Thereby challenging one of the "civilised" world's cherished myths.

Glendon also collected data, for analysis, on the importance attached by different people to counting and says this:

It is apparent, then, that there is no simple way of characterising the traditional societies dealt with here with regard to the way in which they accord importance to counting and number. Also, the degree of sophistication of the numeral system of a given society is not necessarily an index to the extent to which enumeration is important or can be carried out with facility. … it is apparent that, in each of the societies discussed here, ceremonial institutions involving displays of wealth play an important social, economic, and political role. The ability to amass large quantities of wealth items accords status and prestige to clans and individuals. The judgment of quantity, however, varies in each society from the impressionistic to the precise. With the Melpa and Woleai, certain numbers such as 8 or 10 are particularly significant in ceremonial situations. However, to invest numbers in this way with sacred, power, and metaphysical connotations is not necessarily a feature of all societies in New Guinea and Oceania.

The fact that not everything which exists in a society can necessarily be counted is also illustrated and discussed in the thesis, as well as the different counting systems used for different objects, as in this example of the Arosi of the Solomon Islands:

The Arosi live on the island of San Cristobal in the Solomon Islands…The numeral system, like all those of the Austronesian languages of the Solomons, is a 10-cycle one and there are distinct words for 100 and 1000. … In one category we have yams, taro, bananas, stones, and mangoes, all of which are usually counted in groups of five: there are distinct words for groups of 5, 10, 25, 50, 100, 1000, 10,000, 100,000 and 1,000,000. The members of other categories which are counted somewhat differently include coconuts (counted in pairs), banana shoots, sago palm fronds for thatching, pigs and dogs, opossums, fish, eels, breadfruit, dogs' teeth, bats' teeth, porpoise teeth (the various teeth are counted in fours), and shell money. The last is strung and a length of four fathoms is regarded as a unit; there are special terms for groups of 10, 25, 50, 100 and 1000 units of shell money.

We have in his thesis probably the most comprehensive accumulation and study of counting in traditional societies ever undertaken, with a wealth of detailed data. Such a documented collection would have been sufficient for several PhDs! But to think of Glendon's research as just producing a collection of counting systems is to miss some of the most important aspects of the research. It's what you do with the data that always makes a good thesis. As one example, Glendon was able to produce a collection of maps showing where the particular counting systems were located and it was the drawing of these maps and the realisation that there are others which show the migration of various language groups around the region, which suggested to Glendon that he could also look at the diffusion theory of number development (see for example, Crump, 1990, and Seidenberg, 1960). In the finale of his thesis he says this:

In conclusion, the picture that has been reconstructed here of the counting and tally situation in New Guinea and Oceania supports the view that the prehistory of number covers a period of some tens of thousands of years, considerably longer than the 5-6000 years suggested by Seidenberg. There was a long period of time when the dominant system in use was the 2-cycle one: the historical span of its use, far exceeding that of the 10-cycle system, attests to its success as a means of enumeration. While there were periods of relative stasis in the counting system situation, there were also periods of flux and change when new systems were introduced or invented. In the era prior to the arrival of the European colonists there is evidence to suggest that various changes occurred to the counting system situation and that a degree of internal diffusion took place within the region. It is, however, in the colonial and post-colonial period that major and rapid changes have been induced in the traditional means of enumeration in many societies as a result of changes to their political and economic institutions and of the establishment of the pre-eminence of the introduced decimal system of enumeration of the colonial powers. It is in these circumstances that we see the operation of diffusion most decisively and its effect has been to set in train the largely irreversible process of the gradual decline and extinction of many of the region's counting systems which, until recently, have survived as a link to humankind's earliest intellectual history.

From the perspective of this current MERGA conference there are several points from his research on which we could reflect. Here are some of the most important:

- The close relationship to linguistic data analysis suggests that educators and researchers should take the relationship between mathematics learning and language practice far more seriously, particularly in situations where students are learning mathematics through their second or third languages.

- Any empirical research needs to be carried out *in* the communities concerned and with due reference to the languages of those communities. For example, ethnomathematics is situated in the linguistic and social context of the community and can only be abstracted from those contexts after careful analysis.

- Research benefits from a regional perspective, because of the language and social relationships involved. Abstraction can benefit by being related to generalised situations that regional data can offer.

- Researchers from other cultural contexts can derive important and socially meaningful relationships from community-based data, provided they are willing and able to adopt the anthropological methodology which demands immersion in the society and the learning of the language and the practices one is studying.

Finally, and more specifically, Glendon felt strongly that: "There is an urgency about the need to collect and study ethnomathematical practices in traditional societies because of the rate at which languages and traditional knowledge are dying." It is up to all of us here or elsewhere who care about the development of knowledge regarding ethnomathematics to ensure that Glendon's research is not forgotten, but is built upon. It should act as a spur to other researchers to record this kind of detail about the world's cultures before they are all overtaken in the rush to modernism.

It is therefore a pleasure to record here that all his data and analyses have been returned to Papua New Guinea and thanks to the hard work of Wilfred Kaleva and Kay Owens the Glen Lean Ethnomathematics Centre has been established at the University of Goroka, PNG. For information contact the web-site:

http://www.rpi.edu/~eglash/isgem.dir/texts.dir/lean.htm

Let us give the last word on this theme to Glendon. He says:

Twenty-five years ago, on a hot March afternoon, I sailed across the Huon Gulf in a large outrigger canoe accompanied by a dozen or so people returning from market, some worried chickens, and a pig. I was going to spend some time in Labu Taili village and arrange to have a small outrigger made so that I could sail on weekends and visit the nearer villages on the margins of the Gulf. I had recently begun the habit of recording a few items of vocabulary: greetings, items around the village, numerals; I did this also at Labu and later filed away the notes in my beginning collection of numeral data. Some twenty years later I found myself back there for a weekend. The two old men who had been my informants all those years ago had both since died. To continue what had by now long become a habit, I recorded the numerals and other information from some younger informants who had some difficulty in counting in their own language beyond the first few numerals, eventually resorting to the use of *tok pisin* numerals instead. I had found this to be a common experience: within a generation it was apparent that the traditional ways of enumeration in many villages had atrophied and that this largely irreversible process was well advanced.

## References

Crump, S. T. (1990). *The anthropology of numbers.* Cambridge: Cambridge University Press.

Lean, G. A. (1994). *Counting systems of Papua New Guinea and Oceania*. PhD thesis, Papua New Guinea University of Technology, Lae, Papua New Guinea.

Salzmann, Z. (1950). A method for analysing numerical systems. *Word, 6,* 78–83.

Seidenberg, A. (1960). The diffusion of counting practices. *University of California Publications in Mathematics, 3* (Whole number). Berkley: UCLA.