Keith Tognetti

THE UNIVERSITY OF WOLLONGONG
DEPARTMENT OF MATHEMATICS

A45

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Dear Prof Sloane,

Thank you for your E-mail help.

(A) is an expository account of 3 gap theorem (which few have heard of) + the rel. work Fib sequence

(B) gives a sample of the underlying maths.

Read this to send you off to sleep of an evening!

Best Regards

Keith

PS. By way of introduction I include a couple of light notes - as you can see I am an 'amateur' in your area - but what is wrong with doing something because you love it.

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TOG - A SECOND COMING

On 1st December, 1993, *Dr Keith Tognetti*, (formerly Reader, Department of Mathematics, took up duty as a Fellow in the Faculty. *Keith* describes below what his projects are:

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T.S. Eliot - Four Quartets

We shall not cease from exploration
And the end of our exploring
Will be to arrive where we started
And know the place for the first time

Let me begin by saying that I take names and titles rather literally. For example when I was appointed a Reader I attempted to follow the dictionary definition of this word, and what a wide sweep this gave me - "to make out; to interpret; to expound; to make known; to declare; to name; to solve; to understand as by interpretation of signs; to collect the meaning to go over progressively with silent understanding (or with utterance of words) of symbols". Of course in 1519 when the term was first used to denote a higher grade of University lecturer, Readers did in fact read a great deal as many of the students were illiterate - ironically our lecturers might very soon return to this role if student literacy is allowed to degenerate even further (so I am very pleased to see the attempts to bring essay writing into our courses). Apparently for a couple of years before I retired I was the last Reader on the Campus and many of my colleagues mistakenly believed that I took this to be equivalent to being the last gun in the West.

Then (I often find myself doing things in upside down order) I was awarded a PhD. This was much to my amazement, as up to then I was an unqualified success. To find out what I had now become I looked up the dictionary to discover that the word 'philosophy' originated with the Greeks and meant the love of wisdom. Ever since then I have been opening myself up to this love and it has taken me on a rather fascinating self referential exploration which keeps on having me arrive at the place where I started - both physically and in terms of my recurrent mathematics.

So now I am delighted to return to the Faculty as a Fellow and I take this to mean that I should be very active in developing a spirit of Fellowship or collegiality within the academic community. I hope that the description of the projects that follow will show that they are indeed of a nature that encourages such a multi disciplinary approach.

Perhaps the best way to tell you about my projects is to present some short articles for Informatika - so I start with:

ARTIFICIAL LIFE (Or 'ALife' as it is commonly known by its aficionados) is closely allied to Systems Complexity which has recently been given much public coverage. This is a multi-faceted approach to the modelling of computer simulated life systems in which the main concern is the evolutionary development of patterns.

In its simplest form it can be regarded as a generalisation of the modelling approach typified in John Conway's well known Game of Life which is a very nice example of cellular automata. Here the modelling, in contrast to the global and top down approach which characterises much of artificial intelligence, is a bottom up approach based on the emergence of complex patterns from simple local rules.

Using techniques based on Lindenmayer L-systems (which are a special form of finite automata designed for biological developmental systems) my ongoing research has established relationships between integer part sequences, characteristics, chaos, self matching in strings of symbols as well as telegraph codes and games so this gives me a very good basis to enter this field.

The main aim of my ALife computer modelling (in contrast to my analytical work) will be to set up computer pilot systems incorporating the genotype-phenotype concepts and to describe and characterise the patterns emerging from these systems.

The significance of this work is two-fold: biological insights can be used to help in setting up 'life-like' models on the computer and the behaviour of these models can be fed back to biologists so as to sharpen our insights into the processes of natural selection. The work also has ramifications in the area of computer viruses (very dangerous ones that evolve!) and also computer security.

One of the most important results from my analytical work is the identification of evolving patterns of string codes which mimic the stretching and folding characteristic of chaos. This has bearing on the very important area of information structures associated with protein folding.

As some of you might recall, so as to prevent myself becoming too pretentious I like to make jokes against myself hence I give you the following:
Transmogrify = transmute
Transmogrification = a grotesque (I point out that this word does mean a fantastic arrangement of plants and animals), hence transtogmythification, which apparently has something to do with my new position.

Retirement of Keith Tognetti

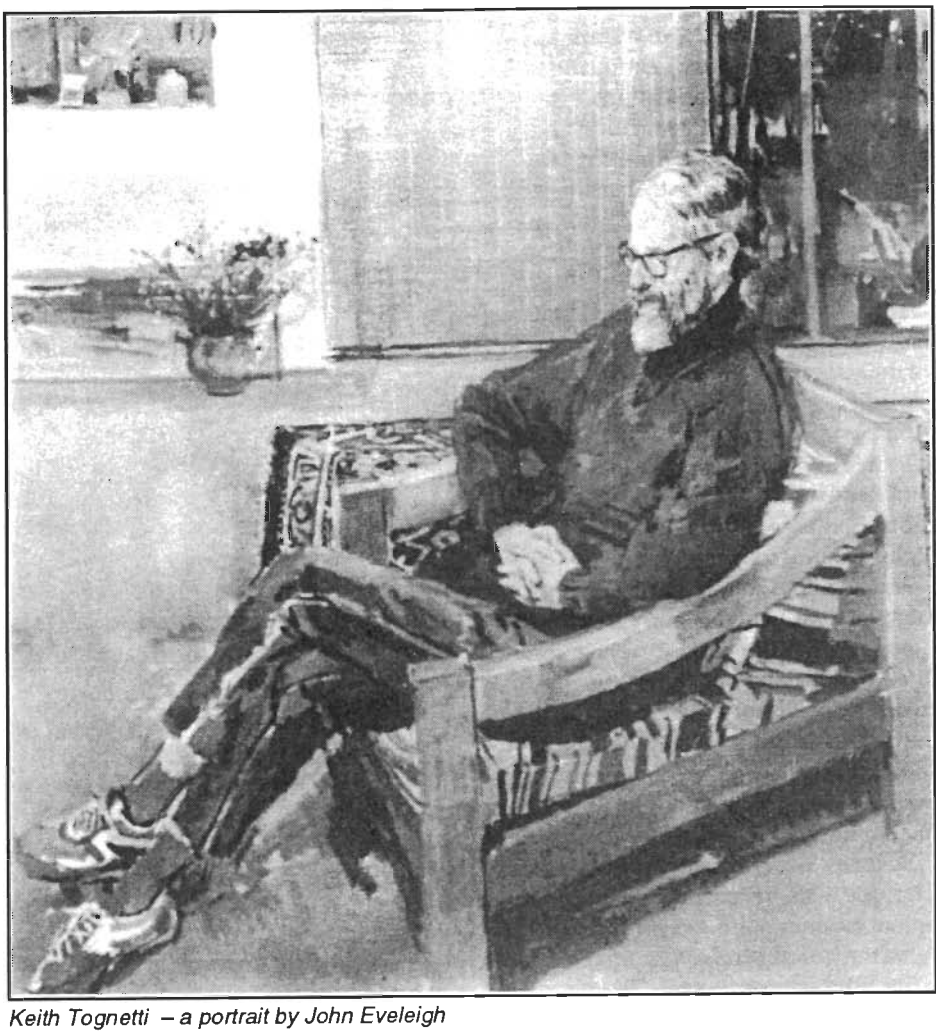
A dinner will be held for Keith Tognetti at the North Beach Novotel on 15 April to mark his retirement.

Mr Tognetti joined the University as a specialist in Operations Research (OR) in 1969, with the expectation that he would probably stay for only a few years.

However, after being involved in many activities in the town (helping start a new school and to set up the Conservatorium and art gallery) and with the gown (he was foundation chairman of the local OR society and initiated the local branch of the Australian Computer Society of which he was secretary, and he also organised the first national seminar in OR), he felt that he was committed to the area and the development of the University.

Before joining academic life, he held several positions – as an engineer (in mining, explosives and atomic reactors), and as manager of a national transport fleet.

His first University appointment was at the Research School of Biological Sciences at the ANU.



Keith Tognetti – a portrait by John Eveleigh

He has had a long association with computer developments in Australia, beginning with UTECOM at NSW in 1961, followed by the first IBM 1620 at the Atomic Energy Commission.

He was in charge of the original 1620 at the University and was executive officer for the selection of its update.

He designed and implemented the first master's degree in Australia in OR with funding support from industry.

He also taught most of the subjects in this course as well as supervising most projects. His teaching ranges over OR, stochastic processes, discrete maths, number theory and chaos. He has also produced many expository teaching notes. He was sometime Chairman of the Faculty of Mathematics .

His research ranges over Reactor Science, OR, military science (Search Theory), Computer Simulation, Population Dynamics, Demography, Queueing, Risk Analysis, Number Theory (emergent patterns) and the mathematical theory of Chaos.

He introduced discrete simulation techniques to Australia (for which he was given a Fellowship of the Australian Computer Society) – the simulations included combat systems, biological populations and OR (including a large simulation of the Port Kembla port operations with an ARC grant).

His modelling in emergent patterns has revealed all sorts of rather beautiful number theoretic relationships in self-similar discrete structures associated with the uniform distribution of points around a circle.

These patterns have a bearing on fivefold symmetry patterns in biology and crystal structures .

His main current interest is artificial life, an emergent new branch of computer science which is concerned with the evolution of computer generated 'creatures'. This has strong connections with chaos theory and fractals.

As a result of his unorthodox entry into mathematics, he feels very strongly that it is most important that every researcher in the mathematical sciences must have a sound basis in pure mathematics.

He is also most concerned that, as we are enticed into the artificial world of computers (virtual reality and so on), we should not let our connections with nature wither away.

Hence he has a deep and increasing commitment towards the conservation of life systems.

Whether it's the thought of Pythagoras, the symmetries of snowflake crystals, the epigrams of Martial, the golden ratio, or the poems of John Shaw Neilson, Keith has an interest and an opinion – the latter usually controversial!

Anyone interested in attending his retirement dinner should contact Carolyn Silveri, ext. 3845.