

The deployment of Mathematics in areas other than those normally associated with mathematical modelling and the applications of mathematics

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### Disclaimers

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On plenary presentations

Leaders in the field working at the frontier of knowledge production

Highly adept researchers with a breadth of knowledge of the domain and can draw attention to open problems in the field

Normally have received recognition through the system of awards that the wider disciplinary's organisational structures distribute for outstanding work in the field



#### MUST BE RECOGNISED TO SPEAK





The primary evidence for assessment of the above three are publications articles in "high profile" journals, books by reputable publishers

I do not satisfy any of the criteria

**Rejection comments** 

We did not think about it (Recreational Mathematics should be in included in Mathematical Literacy)

**Bibliometrics** 

My publication's rejection rate is in the region of 60%



Didactics of Mathematics is outdated (The name given to course on teaching mathematics for in-service teachers)

Must consider paper XXX (not yet published) (referring to teacher's construction of a mathematical model).

This is only a football league table (ethonmethodological analysis on constructing a football league table incorporating factors such socioeconomic status of the location of the football teams)

#### New journal

Academic Cemetery of Mathematics Education





#### **Tone down expectations**



## Introduction

Claudio Alsina the quest of accessability of mathematics should be "... to make visible mathematical dimensions of our daily life on this planet."

**Visible-making** of mathematical dimensions of activities, practices, etc. of our daily life on this planet

**Staircases** 

all humans need stairs which are easy to climb and almost all human beings use shoes

The ideal steps have two important measurements: H (height) and D (depth), related by the affine equation 2H+D = 63 cm. The inclination tan A = H:D is also interesting. What are the upper and lower bounds for H, D and A? When is it convenient to have a ramp and not a stair? In vertical ladders (like in submarines) you face the steps to go down, but in normal stairs you come down the other way around: when is it better to face the steps?



# Visible-making of mathematical dimensions in one of our basic activities EATING



Mateschef un sofrito de numeros y formas para chefs y gourmets

(Mateschef a sauce of numbers and shapes for chefs and gourmets)





Visible-making of mathematical dimensions through maths trails

# MATH TRAILS

Mary Margaret Shoaf Henry Pollak Joel Schneider GUIDE TO STOP 6—Straight Slides (In a park) Measure and record the height of the slide at its tallest point and at its lowest point. Subtract the lowest from the highest and record your results in the numerator of the fraction below.

height of tallest point – height of lowest point distance from tallest point to end of slide







# Visible-making of mathematical dimensions as an objective of ethnomathematics e.g. Gerdes's ethnomathematical project

Learn the production process of peasants, engage in constructing the artefacts and then produce an mathematical description



#### Weaving of 'Litenga' baskets



#### Graph of relationship between a and $\alpha$



#### visible mathematical dimensions of our daily life





How, what and for what purposes is mathematics deployed in activities in daily life outside the realm of the dominant domains?

## ACTIVITIES

## Leisure and recreational reading

Telling and listening to stories



## ON TEXTS USED, SELECTION OF SOURCES AND "METHOD"

#### **Typology of Mathematical Texts**

Category of text	Example	Audience
Book: Expository	Aris, R. (1978).	Area
without exercises	Mathematical modelling	specialists
	<i>techniques</i> . Marshfield,	-
	Massachusetts: Pitman	
	Publishing Limited	
Book: Expository	Giordano, F.R. & Weir,	Students
with exercises	M. D. (1985). A first	
(Textbook)	course in mathematical	
	<i>modelling</i> . Monterey, CA:	
	Brooks/Cole Publishing	
	Company.	
Journal article	Herrero, M. A. &	Area
	Velazquez, J.J.L. (1997).	specialists
	On the melting of ice	-
	balls. <i>SIAM J. MATH</i> .	
	ANAL. 28(1), 1-32.	
Popular texts	Paulos, J. A. (1996). A	General
	Mathematician reads the	public
	<i>newspaper</i> . London:	
	Penguin Books.	



Are generally non-fiction and excluded

Sources --- books, monographs and anecdotal stories

**Biased collection** 

What I have read and heard

Make reference, in one way or another, to mathematics and mathematical workers



## **Excluded readings**

#### mathematics-like title

#### Instructional in flavour





Spark -- Lave's (1991) method of researching and theorising about learning using empirical sites outside of the normal school practice.

Broadly about the use mathematics is put to in books of fiction and stories being told



"mathematics put to"

Uses biblical narrative of Jacob's ladder, albeit the building of staircase to heaven, as background for storying about corruption in some fictious country

Mathematics is not in the foreground. It is mentioned explicitly or it can be inferred from the trend of the story



## **CATEGORIES OF USE OF "MATHEMATICS PUT TO"**

Category: Backgrounding story-lines through encryption and decryption

**Coded Message for opening** of chest of **B I McCool** 

B

Ye heavenly powers! Stand by me when I die!		
The bee ascends before my rolling eye.	bee –	В
Life still goes on within the heartless town.		
Dark forces claim my soul. So strike 'em down.	eye –	- 1
The sea will rise, the sea will fall. So turn		
Full circle. Turn again. And then will burn	'em –	Μ
The lambent flames while hell will lift its head.		
So pray for me while I am numbered with the dead	sea –	С
	sea –	С

Hornblower and the widow McCool (Forester, 1951)

sea –	С
sea –	С
full circle –	-0
again –	0

hell –



Stieg Larsen's Millenium trilogy



Crime fiction novel -- cyber-crime: Hacking, AI, encryption, decryption, large prime numbers, etc



They were staggeringly large numbers which formed a familiar pattern alongisde the numbers next to them. As she looked through the papers and came across the simple sequence 641, 647, 653 and 659, there was no longer any doubt: they were sexy prime quadruplets...

There were also twin primes, and every other imaginable combinations of prime numbers. She could not help but smile. "Awesome".



...in which a pair of autistic and mentally disabled twins recite staggeringly high prime numbers to each other, as if they could see them before their eyes in some sort of inner mathematical landscape.

What these twins were able to do and what Salander now wanted to achieve were two different things. But there was still a similarity, she throught, and decided to try, however sceptical she might be. So she brought up the encrypted N.S.A. file and her program for elliptic-curve factorization.

Acknowledges:

Mathematics mentioned:

Kapersky Lab (anti-virus software company) in Sweden

Primes (RSA-system)

Elliptic-curve factorization



**Professor of Mathematics at Uppsala University** 

Encryption and decryption as a background device in the story-line to create suspense—the essence of crime novels—and not to foreground mathematics









Dahl's created language -- Gobblefunk

Interchanging letters of two words

jipping and skumping—skipping and jumping

Dahl's Chicken – Charles Dickens

shifting letters in the same word

porteedo-torpedo

Pig Latinish— a secret language formed from English by transferring the initial consonant or consonant cluster of each word to the end of the word and adding a vocalic syllable (usually e)

Welcome to ICTMA 18-- elcome-Way o-tay ICTMA-way 18

rotrasper--obvious and left for the reader to decode



Category: Depictions of cleverness, avoidance/dissent and madness

"Die slimmetjie" (the clever one)

Being good at Mathematics bestows a kind of status of cleverness on those who excel in it (in tests and examinations)

In normal conversations people readily admit to not being ot good at mathematics at school. Similar statements for other school subjects are rare

In novels mathematical workers are used in the background to depict both madness and cleverness



He'd knock on my door to ask if I could fix his radio. An old man ... he was fidgety and frustrated, barely acknowledging me even as he asked his favour. I soon realised that his problems were graver than chronic restlessness.

The radio itself seemed to be working fine.... He'd scrawled hundreds of these numbers on his walls, refrigerator, and even on the grubby brown upholstery of his couch. But he couldn't find the pattern if the numbers stopped coming. Without the numbers there was nothing, he said. No meaning behind any of it. Without the numbers there was only chaos and madness...and he threw me out of his apartment...

It was only much later that I learnt that he'd once been the Head of Applied Mathematics at the university — a genius in the field of graph theory. An agoraphobic schizophrenic, but a genius nonetheless





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#### Category: Depictions of cleverness, avoidance/dissent and madness

Teacher's story—an examination script situation



Learner expressing his 'avoidance/dissent' with school mathematics











Social position in society	2-dimensional shape
Soldiers and lowest class of Workmen	Isosceles triangles
Middle class	Equilateral triangles
Professional Men and Gentlemen	Squares and pentagons
Nobility	Hexagons rising in the number of their until they receive the title Polygonal
Priestly class	Circles

Deployment of mathematics to render commentary on social arrangements in 19th century England



Ellis's inaugural lecture as professor of Applied Mathematics at the University of Cape Town

The draconian pass laws—people having to carry permits to be in certain areas—of the white minority rule era in South Africa



Exponential growth of the number of pass law prosecutions per years (thousand of individuals)



Ellis concludes the inaugural address with:

"...the only true basis for freedom is a realistic vision of alternative possibilities before us. Mathematical studies can sometimes help us in understanding what these alternative possibilities are. But such an understanding is quite valueless unless it affects our actions. An understanding of any social wrong, which does not lead to some corrective action to right the wrong, is meaningless."

Mathematics is shifted to background





"So in English a double negative is bad, but in math it's *a positive*?"





*Currently a father is 25 years older than his child. In seven years he will be 5 times as old as his child.* 

What is the father doing now?

Visiting wine farms

Bring net die Engelse grawe (Bring only the English spades.)

Spit tot by Engeland (Dig until you come to England!)





A Word or two



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## Humorous video-clips





### **CONCLUDING COMMENTS**



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THE ROOTLESS NEW CONSTITUTION Law and Order Minister Mr Negative-Roots said that everyone who opposed the new constitution were Communists and would be dealt with severely. He added: "We do not intend to let these Communist agitators disrupt the democratic process. Anyone who tries to hinder the implementation of the new constitution will be prosecuted by in terms of the security laws. Where necessary laws do not exist we will simply create them to deal with these trouble-makers." Mr Complete Square, the Minister of Foreign Affairs, justified the policy to foreign leaders by saying that higher degree equations and polynomials were incapable of playing a role in the government and had to be guided by Quadratics. "The majority of them cannot even be trusted to factorize", Mr Complete Square added.

Used the idea of the existence or not of formulae for solution of polynomial equations to render commentary on the political situation in the country at that time.







"What is this nonsense all about?"

...many of the students in our course study physics as a background for their primary interest in other fields (Richard Feynman)

Learners do school mathematics for different reasons





**Modest proposal** 

Pupils should be afforded opportunities to engage in using mathematics in the kind of somewhat leisure activities mentioned above and others that might emerge. This might allow them to creatively bring to the fore their talents with issues they are interested in in their imaginative ways.





