

My life story.

I was born on the 21st of March, 1941, in Soerabaja, the capital of East Java. This was just before WWII engulfed that region of the world, and days before the curtain set on a 400 year colonial empire of the Dutch in the East Indies. An empire driven by the spice trade and run by the VOC.

At the tender age of 6 months I had to enter my first Japanese POW camp, where my chance at survival were small compared to $\epsilon/2$. My dice came up right and I survived, in large part due to the supreme efforts of two tough women, my mother and my grandmother. In total, our paradise road wound through 4 POW camps, which had such enchanting names as Chihapit (near Bandung), Magelang (in mid Java) and Ambarawah and Barjuberu, both in East Java.

Many did not survive the harsh tropical conditions of a POW camp. Perhaps the gods had stacked my deck, in bestowing me with golden blond hair, which the Japanese soldiers could not resist. This turned out to be a windfall in a camp where there was little food, little hope and *no* medicine. Indeed frequently, when my two women protectors needed extra food, they told me to go and pick the fruits or the vegetables, right underneath the noses of the Nippon soldiers, who thought it was funny and gave me even more to carry home. Stealing such food would have met with more than grave punishment for anyone else! The battle for survival became ever larger as the war went on, because my two mothers had traded all that they possessed, and our food ration had been reduced to

just starch soup. A gooey substance made of potato peels, that would draw long fibres when you lifted a spoon above your plate. It had no nutritional value whatsoever. As such our only source of protein was a supply of big snails that lived in the sewer pipes. But how to get them out of these pipes, that had a cross-section of about 40cm ? You guessed it, it was goldie-locks; that little kid with golden hair. He apparently was agile enough to turn around in the pipes and brought back a daily bucket of juicy snails that were dropped in the porridge to make an indescribable concoction, which we ate. Hey, beggars can't be choosers! Needless to say I was brought up NEVER to throw away food!

My memories of the time just after the war, is one of houses across the street being torched, of machine guns rattling, of bodies in the street, and of snipers being shot out of trees, and then there was us. Scared stiff, hiding in underground cellars, counting the hours. Merdekka had started. Again, my dice came up right and we were saved by the Ghurkas, who herded all pale faces into the local hospital, where they stood watch. Both the javanese and the japanese respected these tough soldiers from Nepal. We were flown to Batavia, because trains never arrived – you can guess what happened to their blanko passengers! – and embarked on the JvO (Johan van Oldenbarneveldt) for Holland. On board the dice rolled one more time, this time double six! We met my father whom we had not seen or heard of in 4 years, and who had worked on the Atjeh (in Sumatra) railway, and at 39.5 kg escaped being shipped to Japan, by half a kilo ! All those over 40kg ended up on the bottom of the Java sea. The ships they

were packed into were all bombed by the US airforce – and sunk. Little did they know!

On board I tasted my first red delicious and still remember the big blue cans of US corned beef that we were stuffing ourselves on. Many did not survive the transition. We had received none of the food that had been dropped for us during the closing stages of the war.

My arrival in Holland was on a stretcher and under 5 blankets. I had measles and Holland was going through the coldest winter in 100 years. Life in Holland was not easy. The country had to be build up and no one was allowed to leave. Especially not electrical engineers. Having been born and raised in the tropics, we all had enough trouble with the dutch climate. We ended up in Hilversum – the radio city –, and I attended a wonderful Montessori school followed by the HBS, a solid no nonsense highschool, with saturday classes. There, I learned to work and compete, and discovered my own limitations. I was good in science and math but pretty lousy in french. Not to speak of dutch and german. During these years my father, tried very hard to get a job with Philips overseas. We almost ended up in Argentina, South Afrika, Canada or the US. Finally in 1958, he got a job with Philips in Adelaide Australia, so we packed up, and I had to leave in the middle of my final year of high school! Boarding was not the done thing in those days.

We made a 6 week's trip on a migrant ship which, low and behold, was a born again JvO! The trip was one long ping pong game, and we were glad to reach Fremantle, our first step on Terra Australis. We steamed on to Melbourne,

where we disembarked and had to travel 450 miles by steam train to Adelaide, our new home! Adelaide had just dug up all its trams (but one) and made a hot dusty first impression. I matriculated from Unley High school, in leaving-honours, and even passed english! which must have been because of the essay that I had to write on: “my first memories”! I entered the university of Adelaide in science and decided to major in math, which was my best subject. At that time the universities were not for free, and I HAD to win a commonwealth scholarship, or else it was picking grapes along the river Murray for me. Those dice rolled again— and I managed to land a scholarship, but I had to become Australian. I did an honours degree in math and during the summer picked grapes and grapefruits, stacked coldrink trucks, working as a stockman or punched in computer programs at the WRE (weapons research establishment). All welcome changes from math.

Next, I entered the doctorate program in applied math under Renfrey Potts, the father of the Potts model. I often think back with fond memories to my time at Adelaide U., the swims at Glenelg, the hockey games at the Waite Institute, the Prosh balls, the wine tasting at Moore’s at the square, and the pubcrawls through Rundle street. My years in Adelaide were some of the happiest of my life. I still think of Adelaide as “home” even after all these years. Yes, it was there where my youth was traded in for manhood. And we all long back to our youth,

“where you long to stay young, in those splendid days of
sun”

During my PhD studies I met my wife Ingrid Kaldun, at

Wonderland by night, a dance hall where the girls set on chairs against the walls and the men congregated in the center of the hall. When the big band started to play, there was a mad dash for the nearest skirt! A sight to behold.

Ingrid had come over from Germany for a 2 year visit to see her aunt. After a three year courtship we got married on Friday the 13th! - our lucky day, at Hahndorf SA, just after I received my PhD. We needed her quota and my qualifications, to get a visum for the US, and left for a 6 weeks trip with the P&O line to the US, via New Zealand, Fiji and Hawaii. I post-docked two years at Cornell with Michael Fisher, and started as assistant prof at NCSU in Aug of 1968. And here I am, 40 years later, retired , writing poetry besides math, and reflecting on the world that my children and their children will inherit! They have flown the nest for greener pastures in London, New York or DC. Oh, where did that time go ?

And what legacy did I leave on this lonely planet ? The following are my main contributions to history:

(a) The Fisher-Hartwig theory, based on the asymptotic formula

$$\ell n D_N(c) = N k_0(b) - \left[\sum_{j=1}^g (\alpha_j^2 - \beta_j^2) \right] \ell n \mu N - Z_{\alpha_1, \dots, \beta_g}(b) + o(1)$$

for a Toeplitz determinant of size N, generated by a function $c(\theta) = b(\theta) \prod_{j=1}^g t_{\alpha_j}(\theta - \theta_j) u_{\beta_j}(\theta - \theta_j)$, where $t_{\alpha}(\theta) = (1 - e^{-i\theta})^{\alpha} (1 - e^{i\theta})^{-\alpha}$, $u_{\beta}(\theta) = |2 \sin \frac{\theta}{2}|^{2\beta}$, $|\alpha_j \pm \beta_j|$ are non-integral and Z depends on $\alpha_i, \beta_j, \theta_k$.

(b) The minus (also called plus or natural) partial order

on regular semigroup elements defined by

$$a \leq b \text{ iff } a^-a = a^-b \text{ and } aa^- = ba^-, \text{ where } aa^-a = a$$

It forms the basis of all partial order theory on semigroups.

(c) The discovery that Rank Subtractivity:

$$rk(B - A) = rk(B) - rk(A)$$

is a partial order on $m \times n$ matrices over a field. It is indeed equivalent to the minus partial order. It forms the basis of the concept of "semigroup-orthogonality".

(d) The limiting formula for the Classical Gram-Schmidt orthogonalization procedure in terms of Moore-Penrose inverses (with X.Chen).

(e) The grade-s-adjoint expansion over semirings (with P.Poplin):

$$\mathcal{C}_s^+(A) \cdot \mathbb{A}_s^+(A) + \mathcal{C}_s^-(A) \cdot \mathbb{A}_s^-(A) + |A|^- I = \mathcal{C}_s^+(A) \cdot \mathbb{A}_s^-(A) + \mathcal{C}_s^-(A) \cdot \mathbb{A}_s^+(A) + |A|^+ I$$

where

$$(\mathcal{C}_s^+(A))_{pq} = |A_{\beta_q}^{\beta_p}|^{\pi(p+q)} \quad \text{and} \quad (\mathcal{C}_s^-(A))_{pq} = |A_{\beta_q}^{\beta_p}|^{\pi(p+q+1)}$$

are the positive and negative grade-s-compound matrices and

$$(\mathbb{A}_s^+(A))_{pq} = |A_{\beta_q}^{\beta_p^c}|^{\pi(|\beta_p|+|\beta_q|+p+q)} \quad \text{and} \quad (\mathbb{A}_s^-(A))_{pq} = |A_{\beta_q}^{\beta_p^c}|^{\pi(|\beta_p|+|\beta_q|+p+q+1)}$$

are the positive and negative grade-s-adjoints, where α and β have length s .

(f) The 9-11 poem *forever tall* (written 9-11-02):

*where twin towers stood tall
in the new morning sun
where employees rushed in,
a new day had begun
where nations in numbers
did business and trade,
where thousands succumbed
in an avalanche of hate
where a wail echoed shrill
round the globe, through my soul
where grim passage was paid
for whom the bells toll
will we ever be able
just to fathom the ache
of the families and loved ones
that were left in its wake ?
where hundreds of heroes
did answer the call
and laid down their lives
for the salvation of all
where our innocence perished
in a deluge of dust
where our resolve was reborn
standing firm as we must
we shall ascend from the ashes
with dedication and grit,*

*with respect and with prudence
to face the future with wit
we shall serve strings of silence
bow our heads on this day,
fill our hearts with compassion
before we fleet on our way
for ever
tall.*

Robert E Hartwig