Changes in perinatal intensive care and their consequences over the past 50 years

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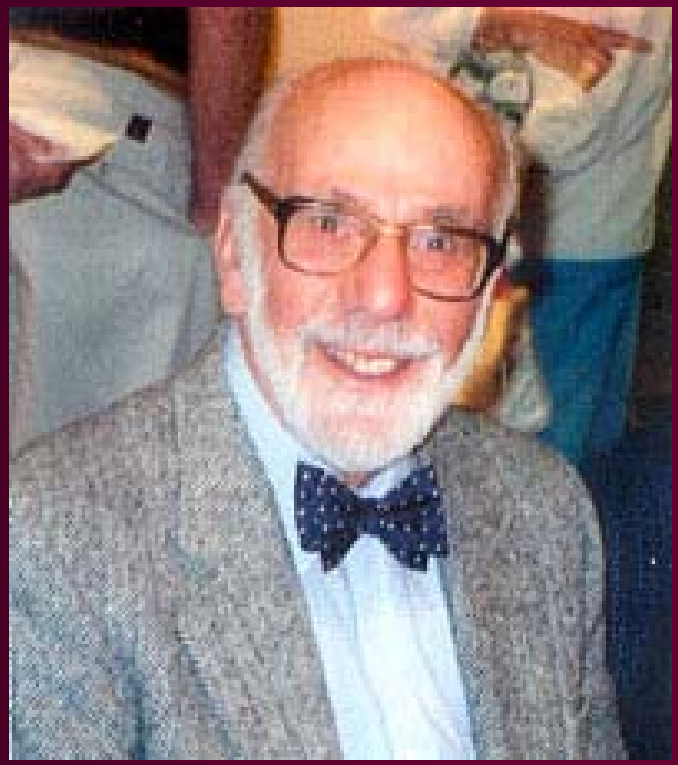
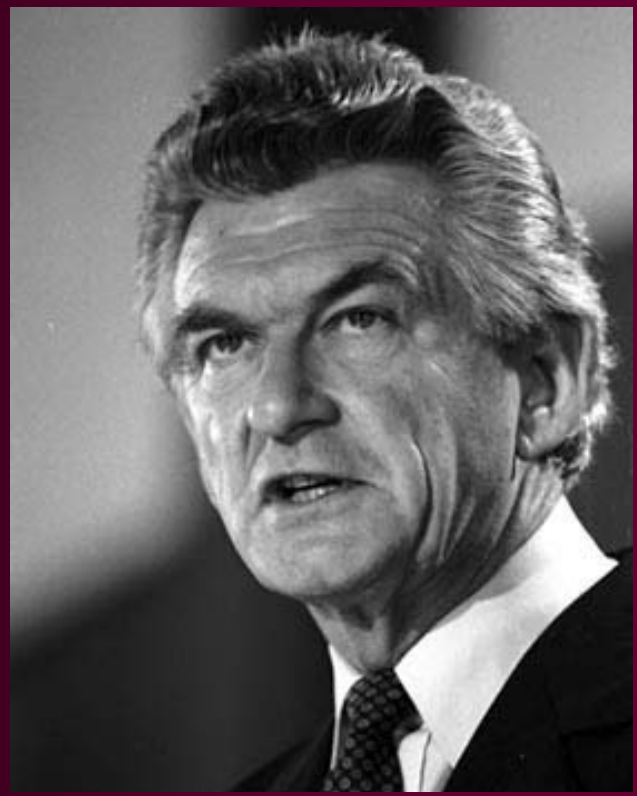
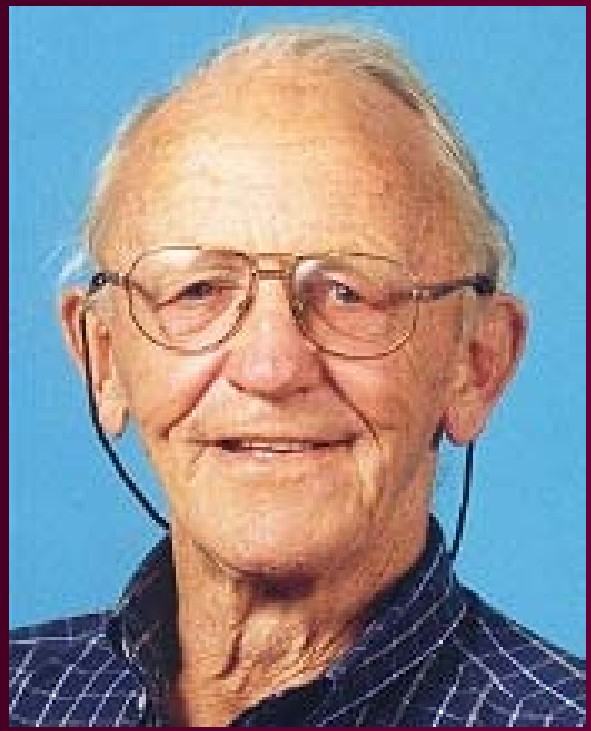


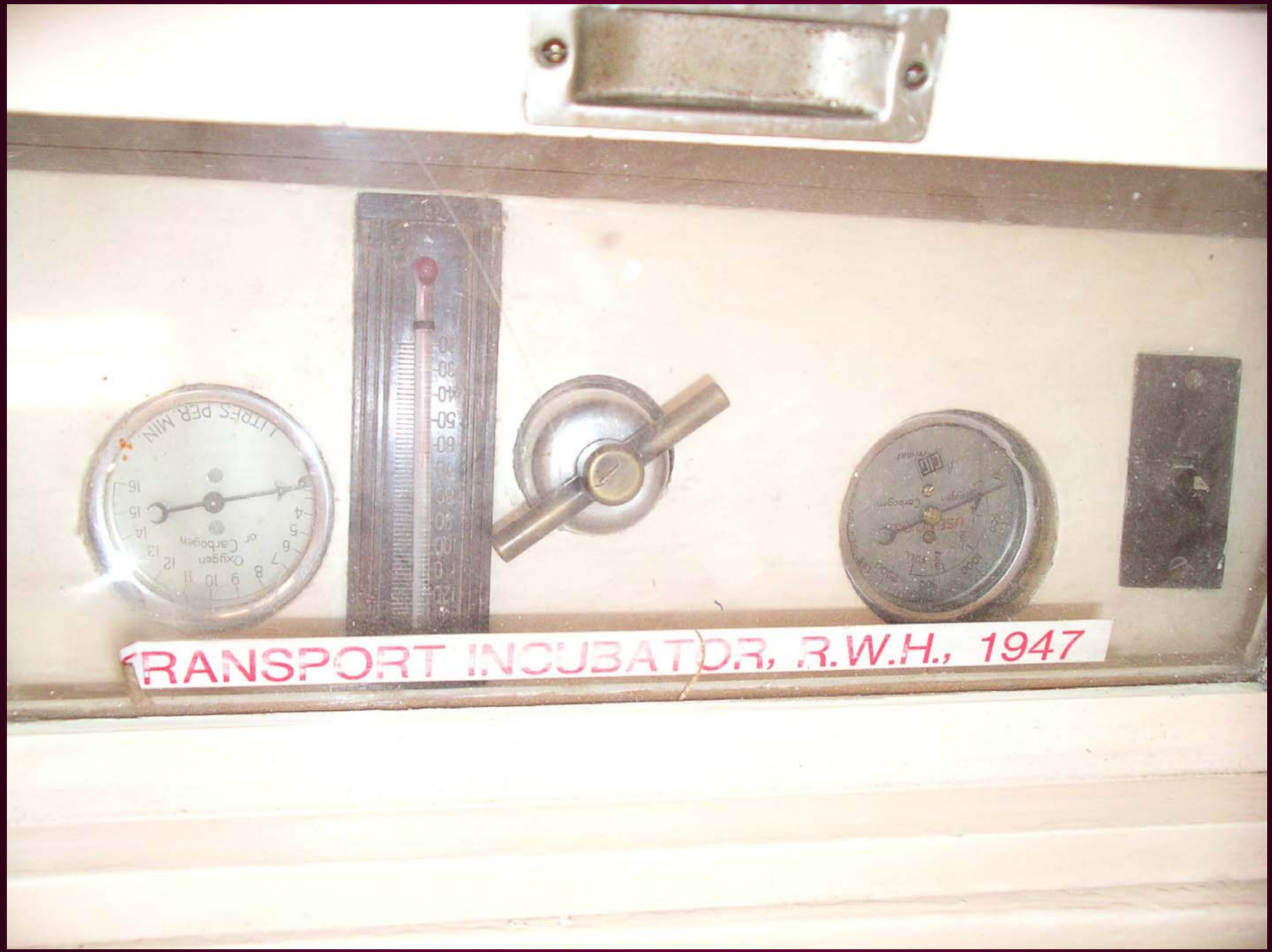




Prior to 1950

- Few survivors <1500 g or < 30 weeks
- Commonest cause of death of preterm infants - respiratory distress caused by hyaline membrane disease (HMD) (surfactant deficiency).
- Oxygen introduced into nurseries

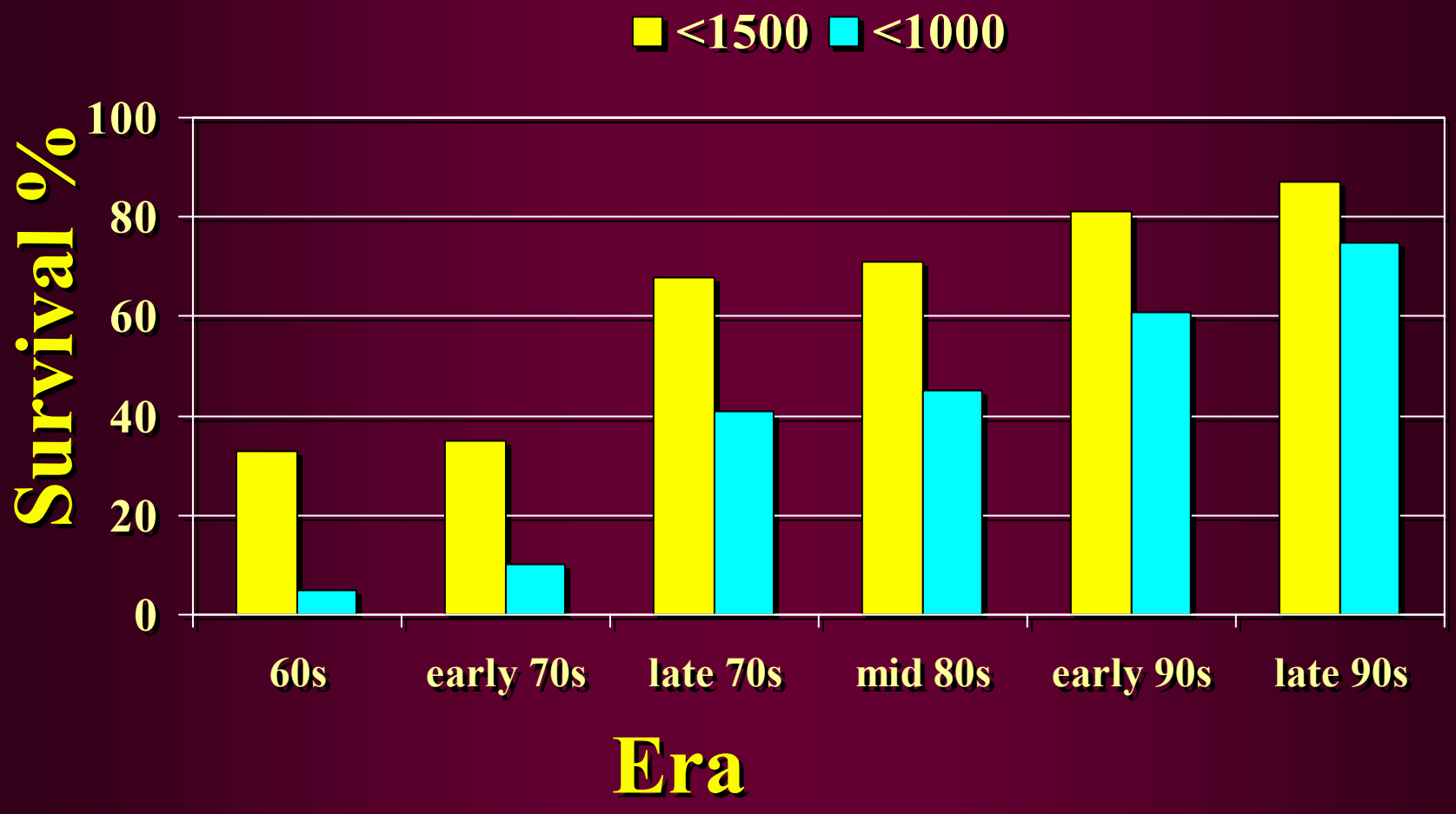

PREMATURE INFANT HUMIDICRIB, 1949
Designed and built at the Women's Hospital by Dr Refshauge and the hospital engineering, Mr J Murphy, this cot was a major improvement in the care of premature infants.
The humidicrib was designed to be portable, to transport premature babies from one hospital to another while ensuring a certain temperature and flow of oxygen. It was the forerunner of the Newborn Emergency Transport Service (NETS) of the Women's Hospital today.
Before the development of the incubator, the survival chances for premature babies were slim, mainly due to babies becoming too cold after birth. The need for a special incubator was recognised as early as 1876 by The Women's Hospital when Honorary Medica...Staff asked the Committee of Management, "that a special incubator for the reception of premature infants be purchased".
THIS COT SAVES LIVES
WOMAN'S DAY ARTICLE ABOUT THE HUMIDICRIB (7 NOVEMBER 1949)
RANSPORT INCUBATOR, R.W.H., 1947


LITRES PER MIN
Oxygen
or Carbogen
TRANSPORT INCUBATOR, R.W.H., 1947

After 1950

- More survivors <1500 g or < 30 weeks
- Some survivors <1000 g or < 28 weeks

Survival Rates <1500 g RWH



Advances after 1950

- Oxygen as cause of blindness
- Ability to support breathing
- Successful reduction of HMD as a major cause of death
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Oxygen and Blindness

- 1940s – development of incubators with ability to maintain oxygen at high concentrations for long periods
- oxygen reduced periodic breathing
- "routine" inspired oxygen >50% for >28 days for infants <1500g
- "Boston disease" – retrolental fibroplasia (RLF)
- retinopathy of prematurity (ROP)

Oxygen and Blindness

- 1948 – NHS in Britain
- sudden appearance of RLF
- 1951 – Mary Crosse (Birmingham) speculated on oxygen as possible cause

Oxygen and Blindness

Oxygen and Blindness

- Campbell K. Intensive oxygen therapy as a possible cause of retrolental fibroplasia: a clinical approach. Med J Aust 1951;2:48-50.
- "I heard from colleagues returning from overseas, the suggestion that oxygen might be responsible for causing retrolental fibroplasia."

Oxygen and Blindness

- Campbell K.
- 3 hospitals 1948-1950

  - 1 could afford oxygen therapy – piped into ward and given via oxygen cot 40-60%

  RLF 19%

  - 2 – restricted oxygen

  RLF 7%

Oxygen and Blindness

- Subsequent RCT of "liberal" vs "restricted" oxygen (O_2 only if needed, <50%)
- Competing risks of blindness vs death vs brain injury
- RCT – causative role for oxygen in ROP
- Forgot about the long-term outcomes!

Oxygen and Blindness

Era of Restriction of oxygen

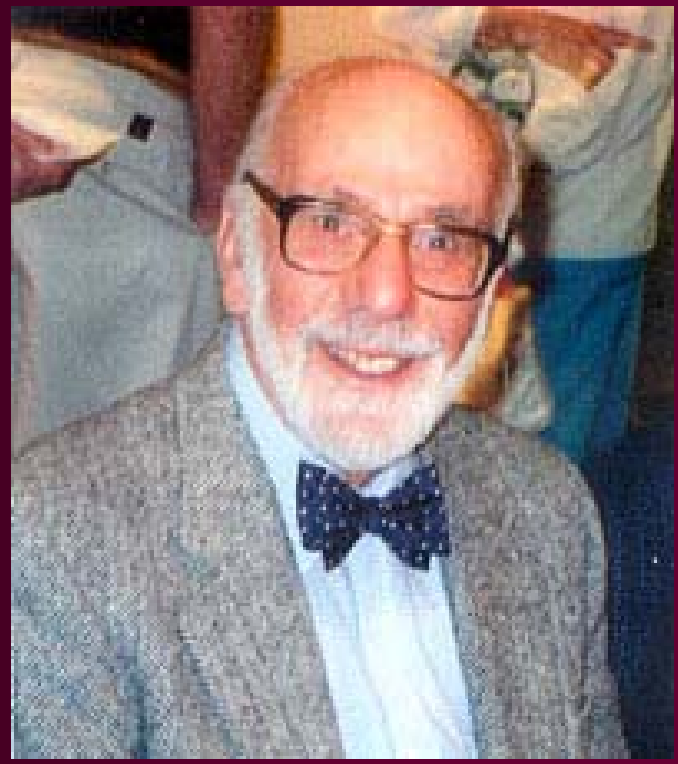
- **Mortality increase from hyaline membrane disease**
- **in RCT infants >48 hours old**
- **16 deaths for each case of blindness prevented**
- **Cerebral palsy increase, especially spastic diplegia**

Oxygen and Blindness

Switch from inspired oxygen to

- 1960s - arterial pO_2
- 1970s-1980s - transcutaneous pO_2
- 1990s-2000s - oxygen saturation (sat O_2)

Oxygen and Blindness



Oxygen and Blindness

Bill Silverman

"Retrolental Fibroplasia – a Modern Parable"

" To put it bluntly, there has never been a shred of convincing evidence to guide limits for the rational use of supplemental oxygen in the care of extremely premature infants."

Pediatrics 2004; 113:394-396

2005 – NHMRC funding for "BOOST2" - RCT of different levels of sat O_2

Other studies – SUPPORT, COT, NZ, England

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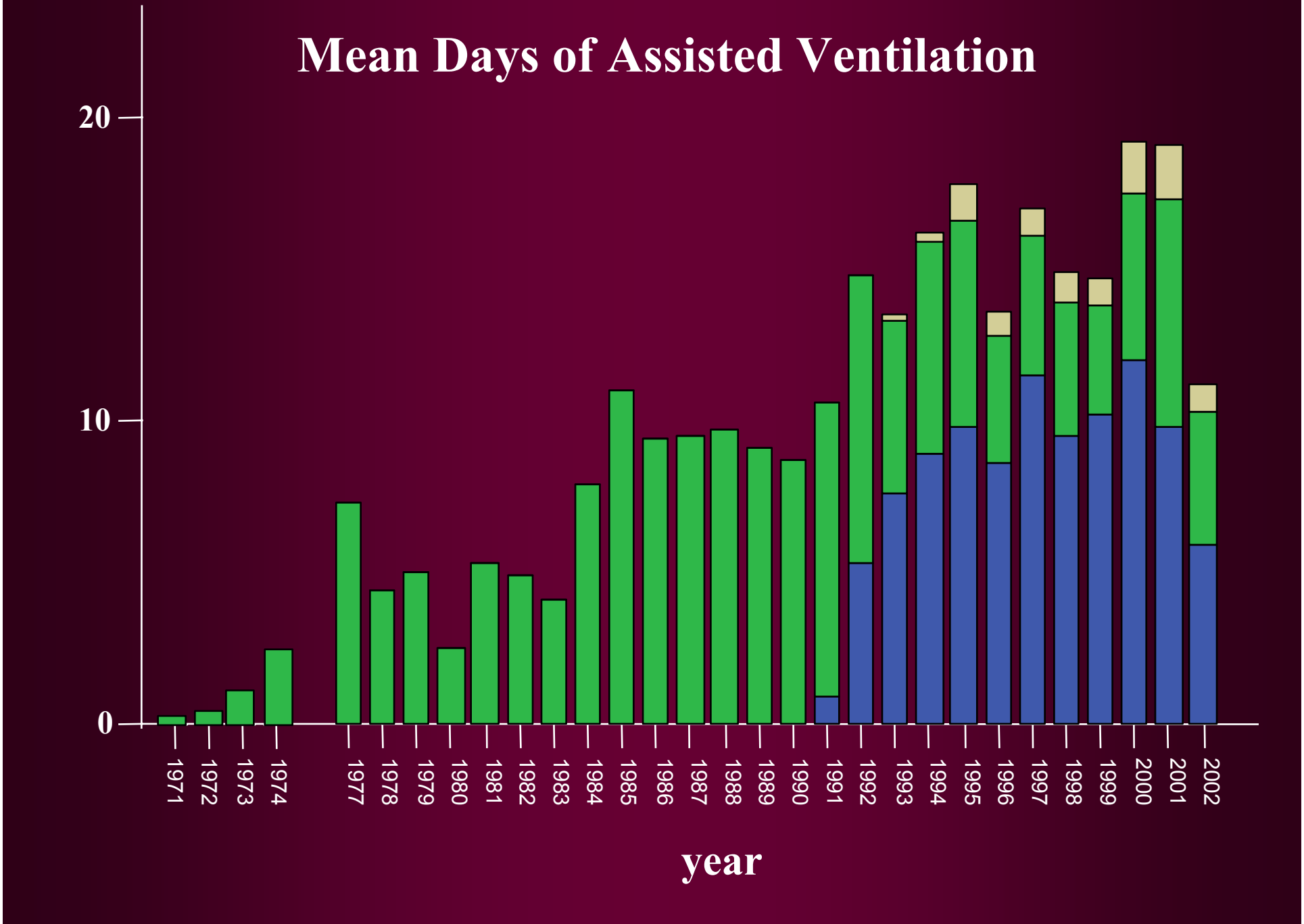
Ability to Support Ventilation

1950s and 1960s

- adult ventilators
- used as last resort in dying babies
- survival rates very low
- “work of the devil”

1970s

- infant ventilators
- used earlier in the course of the disease
- survival rates rose


Mean Days of Assisted Ventilation
20
10
0
1971
1972
1973
1974
1977
1978
1979
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1986
1987
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1989
1990
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2001
2002
year

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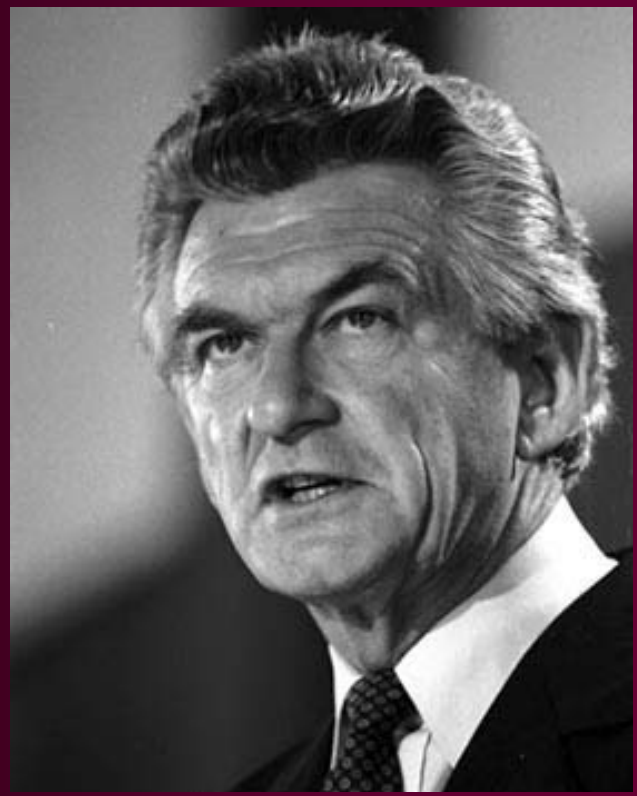
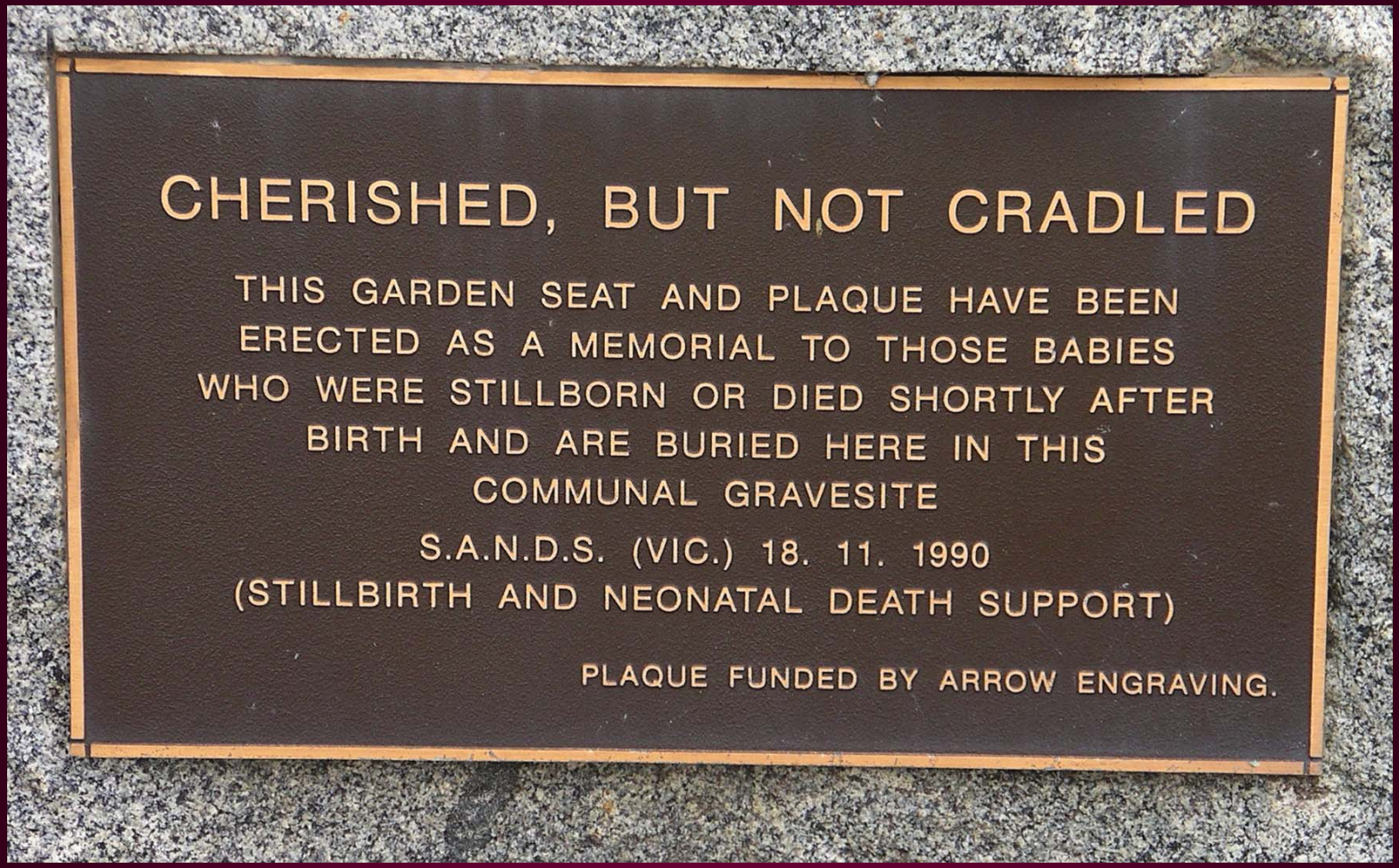


What do these two men have in common?

Why was August 1963 a bad month for both of them?

Where is this place?

Where is this place?



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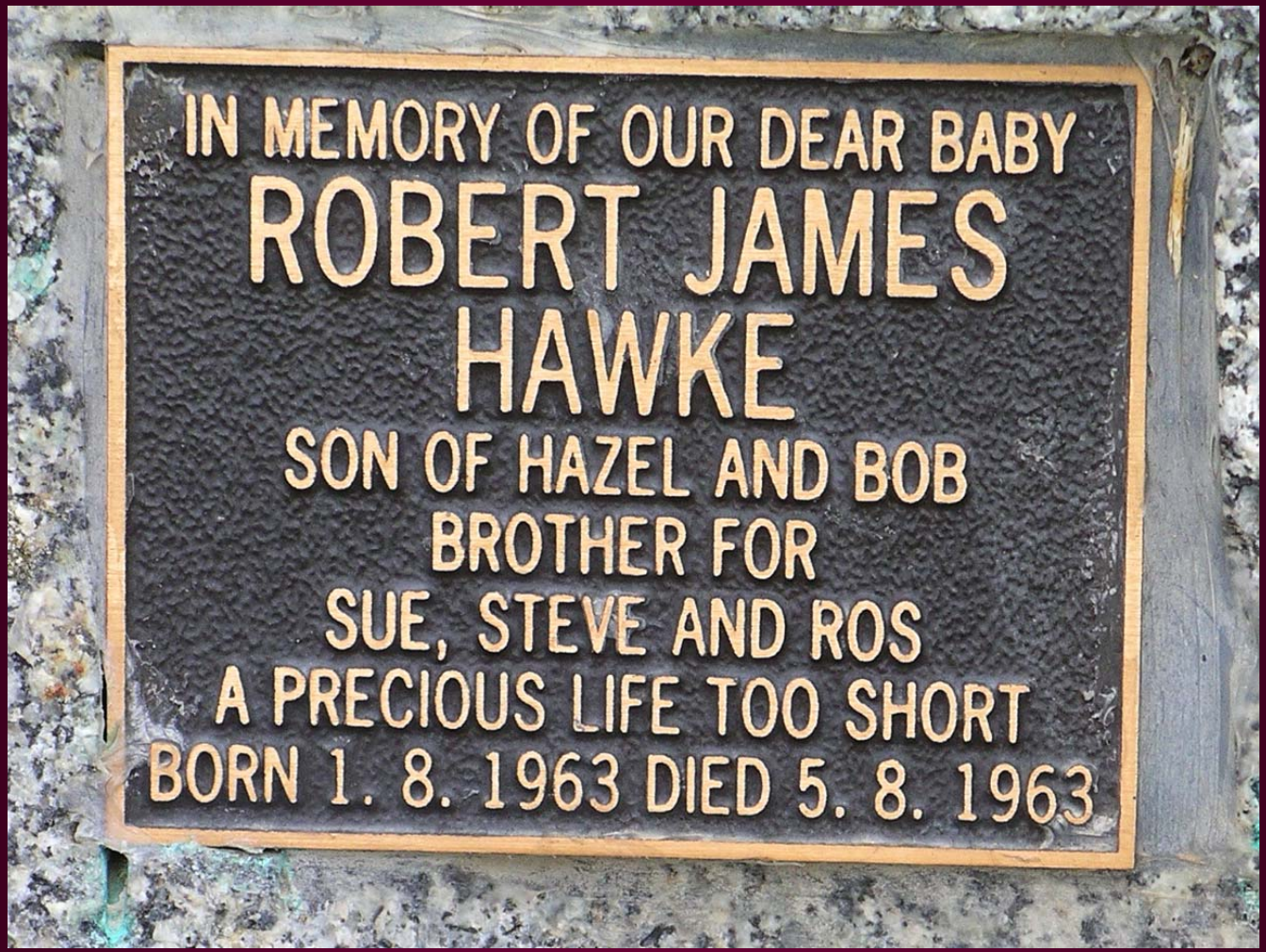


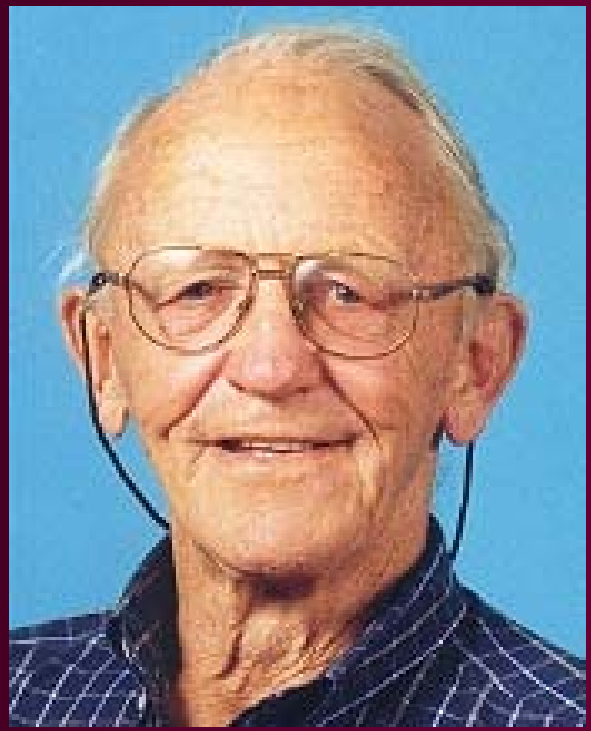
Bob Hawke

- Robert J Hawke Jr.
- 33 weeks' gestation
- Born 1st August 1963
- Died after 4 days from respiratory distress
- Almost certainly HMD (surfactant deficiency)

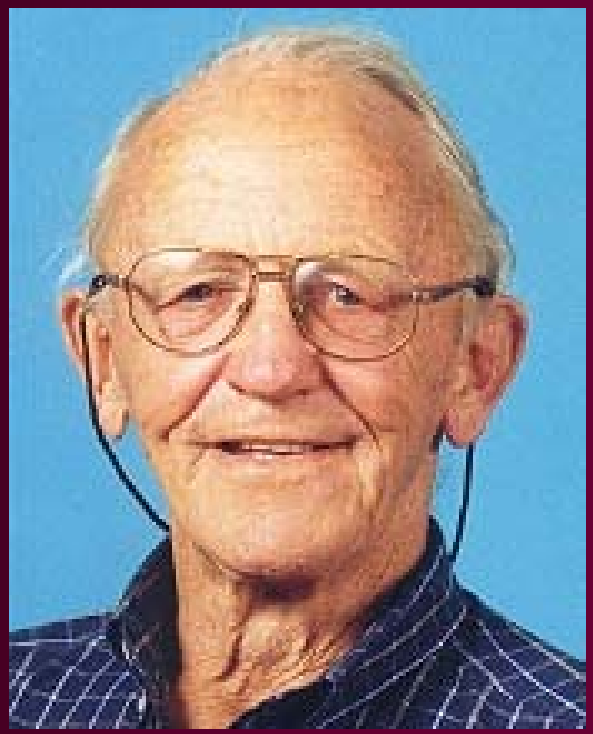
JFK

- Patrick Bouvier Kennedy
- 34 weeks' gestation
- Born 7th August 1963
- Died after 2 days from respiratory distress
- Almost certainly HMD (surfactant deficiency)

World History Changed Forever by Lack of Surfactant!



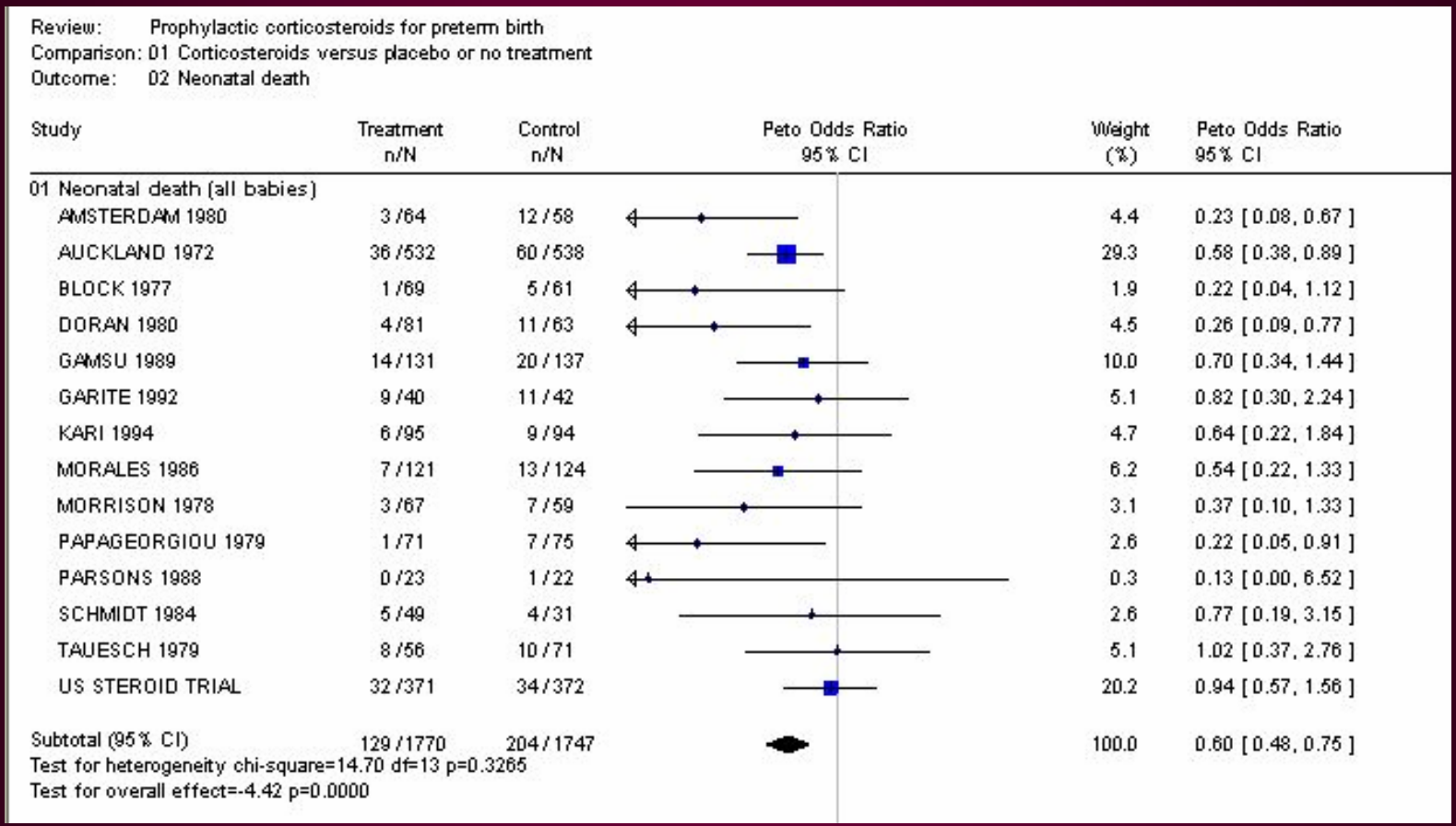
Graham “Mont” Liggins



"Mont" Liggins

Antenatal corticosteroid therapy

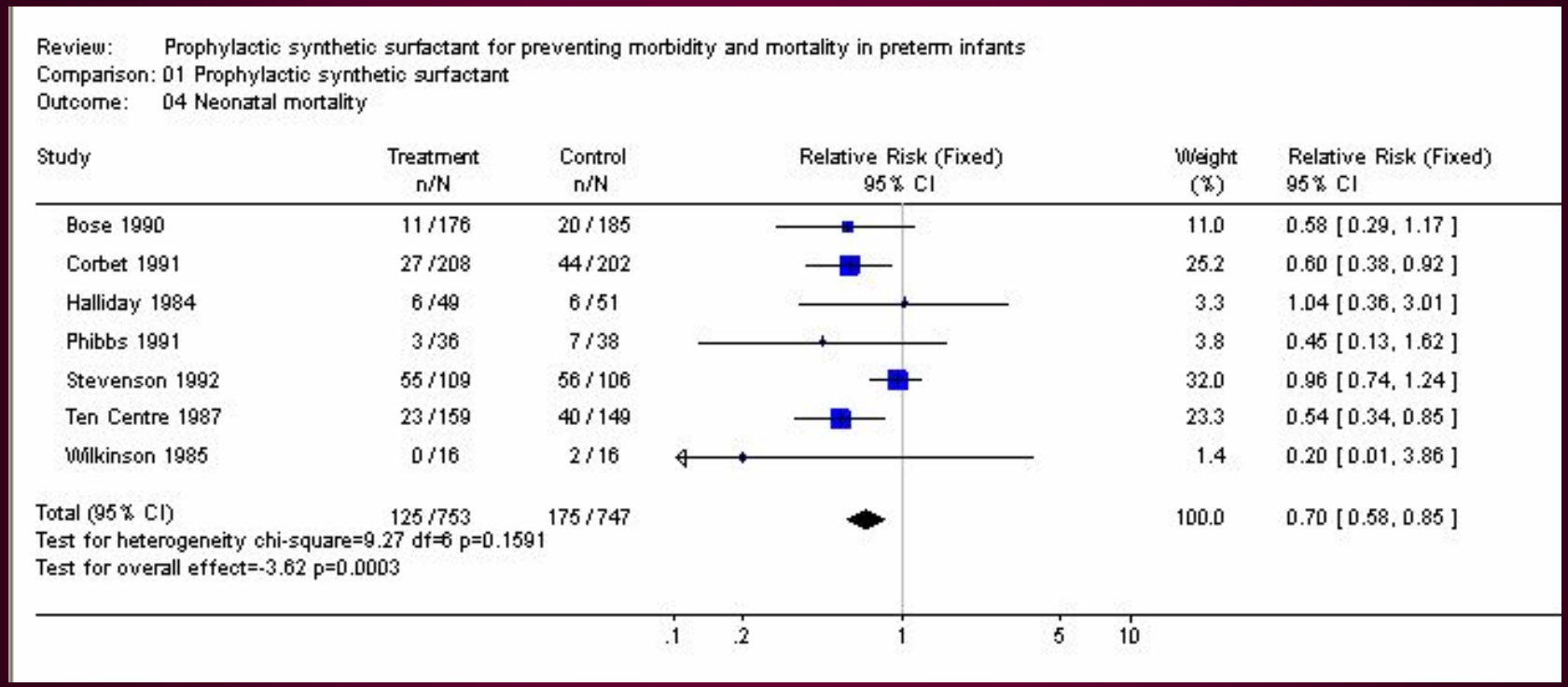
Review: Prophylactic corticosteroids for preterm birth
Comparison: 01 Corticosteroids versus placebo or no treatment
Outcome: 02 Neonatal death



Study	Treatment n/N	Control n/N	Peto Odds Ratio 95% CI	Weight (%)	Peto Odds Ratio 95% CI
01 Neonatal death (all babies)					
AMSTERDAM 1980	3 /64	12 /58		4.4	0.23 [0.08, 0.67]
AUCKLAND 1972	36 /532	60 /538		29.3	0.58 [0.38, 0.89]
BLOCK 1977	1 /69	5 /61		1.9	0.22 [0.04, 1.12]
DORAN 1980	4 /81	11 /63		4.5	0.26 [0.09, 0.77]
GAMSU 1989	14 /131	20 /137		10.0	0.70 [0.34, 1.44]
GARITE 1992	9 /40	11 /42		5.1	0.82 [0.30, 2.24]
KARI 1994	6 /95	9 /94		4.7	0.64 [0.22, 1.84]
MORALES 1986	7 /121	13 /124		6.2	0.54 [0.22, 1.33]
MORRISON 1978	3 /67	7 /59		3.1	0.37 [0.10, 1.33]
PAPAGEORGIOU 1979	1 /71	7 /75		2.6	0.22 [0.05, 0.91]
PARSONS 1988	0 /23	1 /22		0.3	0.13 [0.00, 6.52]
SCHMIDT 1984	5 /49	4 /31		2.6	0.77 [0.19, 3.15]
TAUESCH 1979	8 /56	10 /71		5.1	1.02 [0.37, 2.76]
US STEROID TRIAL	32 /371	34 /372		20.2	0.94 [0.57, 1.56]
Subtotal (95% CI)	129 /1770	204 /1747		100.0	0.60 [0.48, 0.75]

Test for heterogeneity chi-square=14.70 df=13 p=0.3265
Test for overall effect=-4.42 p=0.0000

Exogenous surfactant



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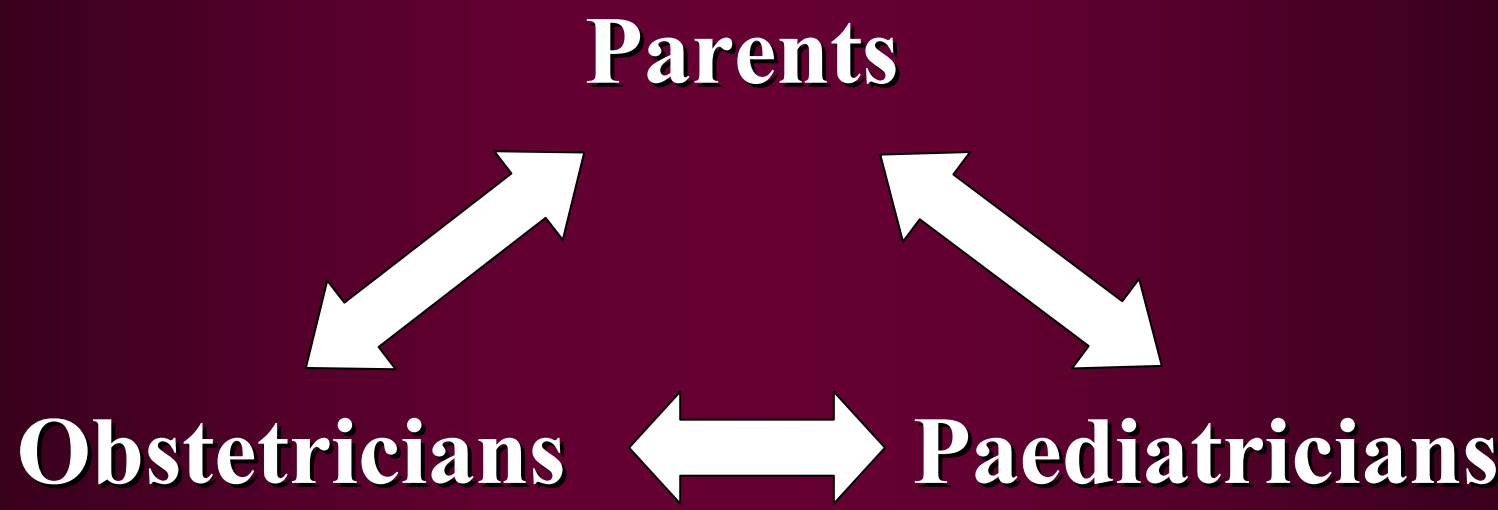
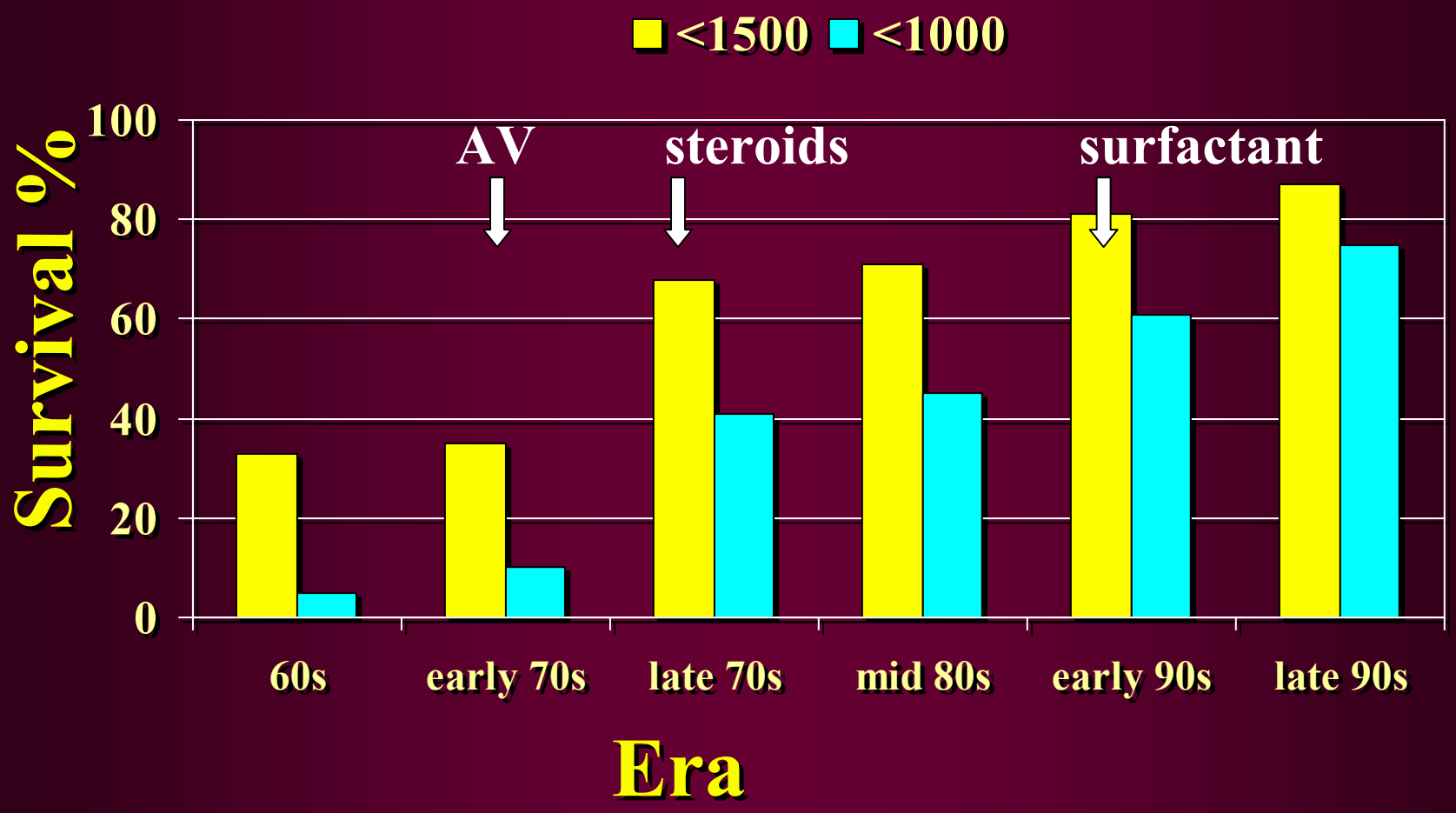
Increased willingness to treat



Survival Rates <1500 g RWH



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miscarriage

WH (Bill) Kitchen

- First trial of “intensive care”
- Ability to measure pO_2, infuse glucose and HCO_3
- <1501 g birthweight
- 1966-1970 Royal Women’s Hospital
- increased survival
- increased “handicap” in survivors

WH Kitchen

- Evaluation of intensive care for infants of birthweight 500-999 g in Victoria
- Victorian Infant Collaborative Study Group
- 1979-80, 1985-87, 1991-92, 1997, 2005

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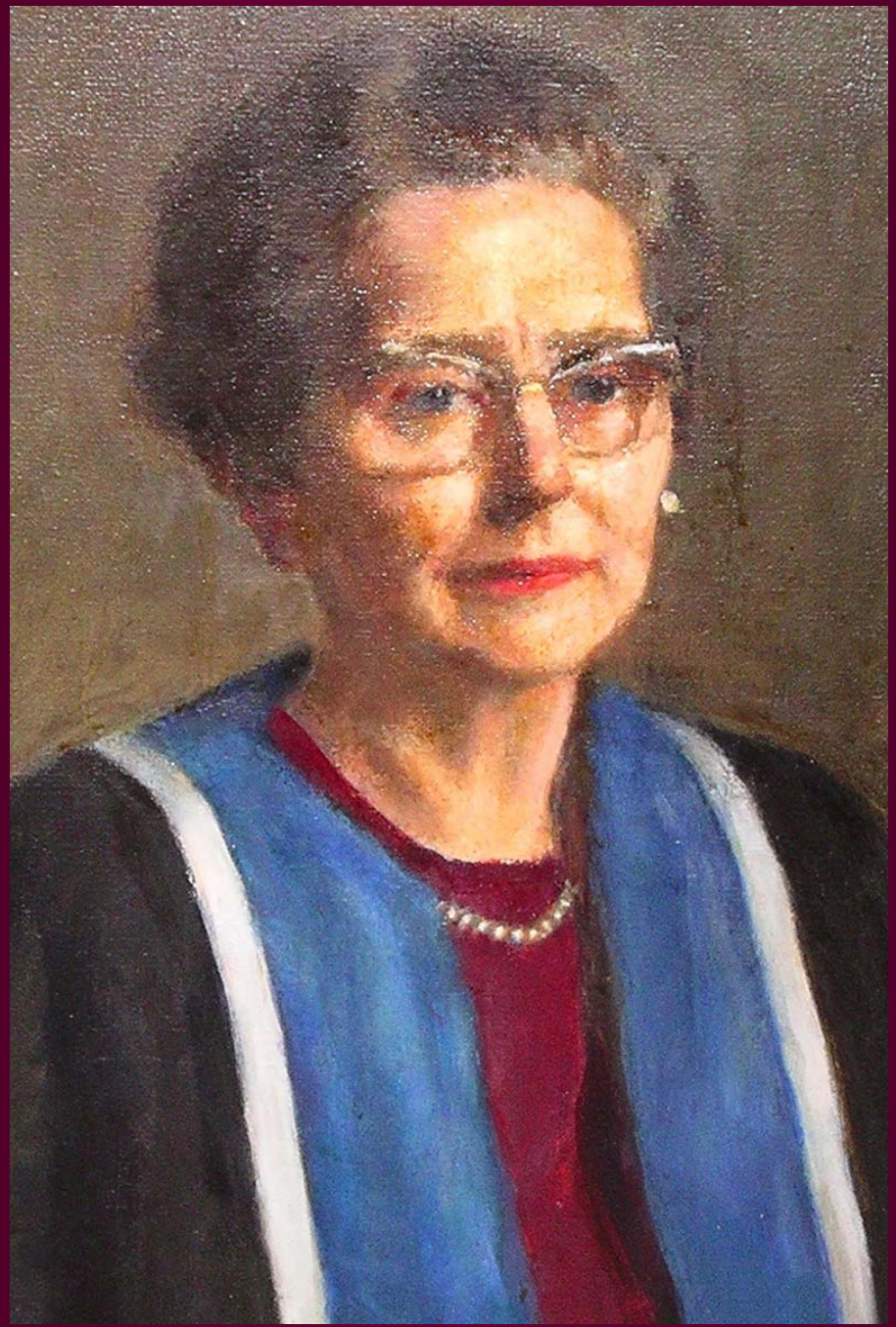

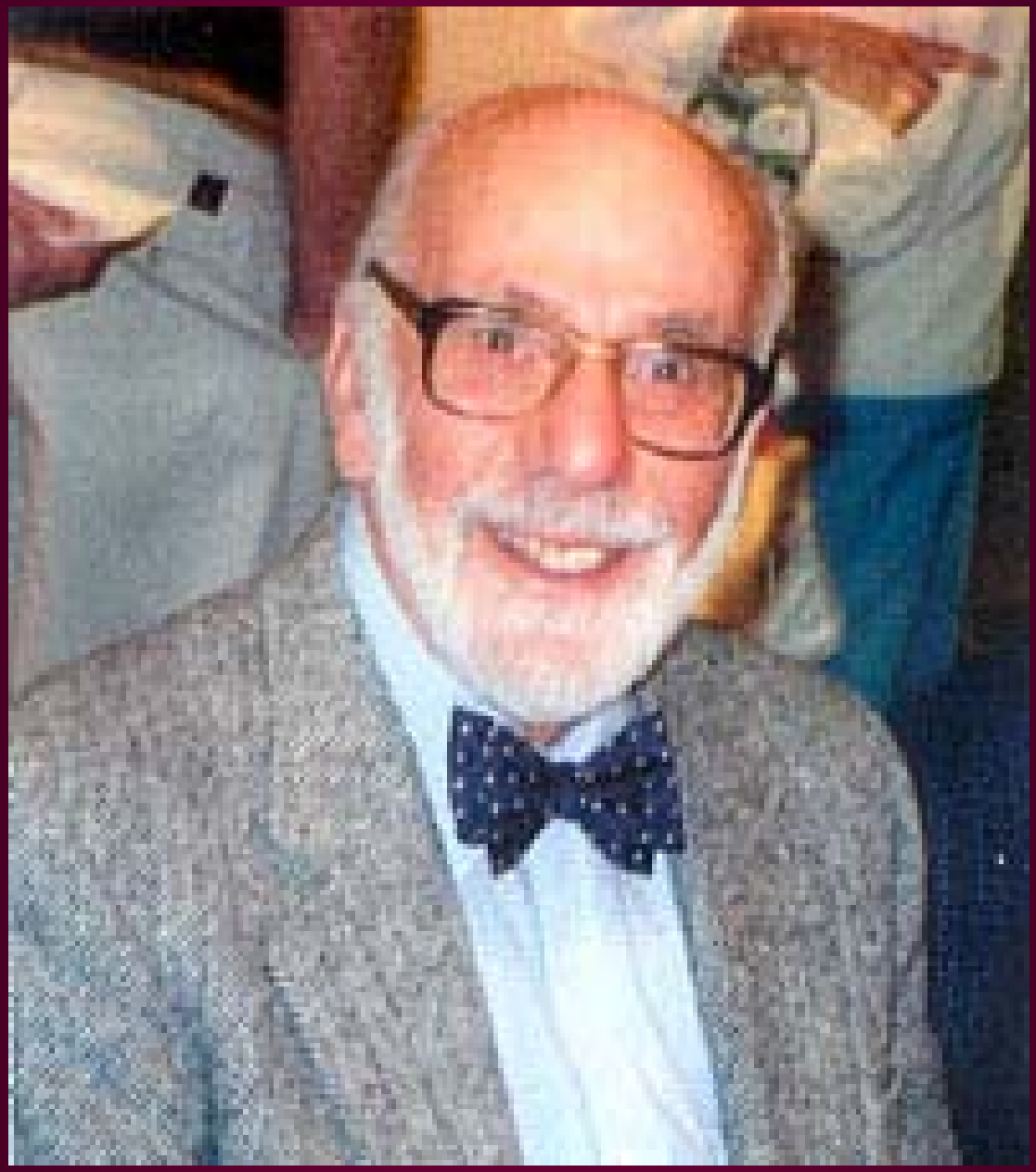

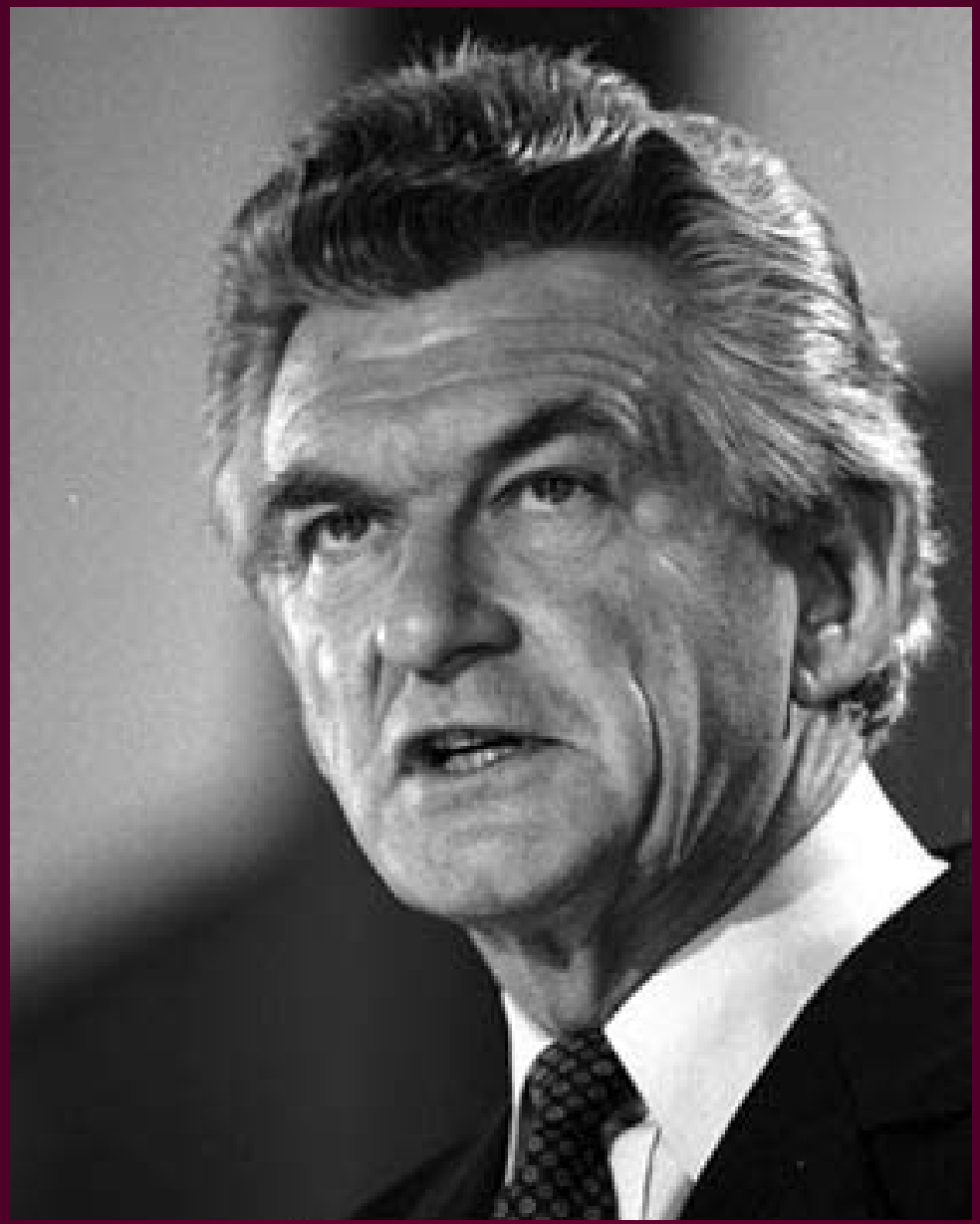

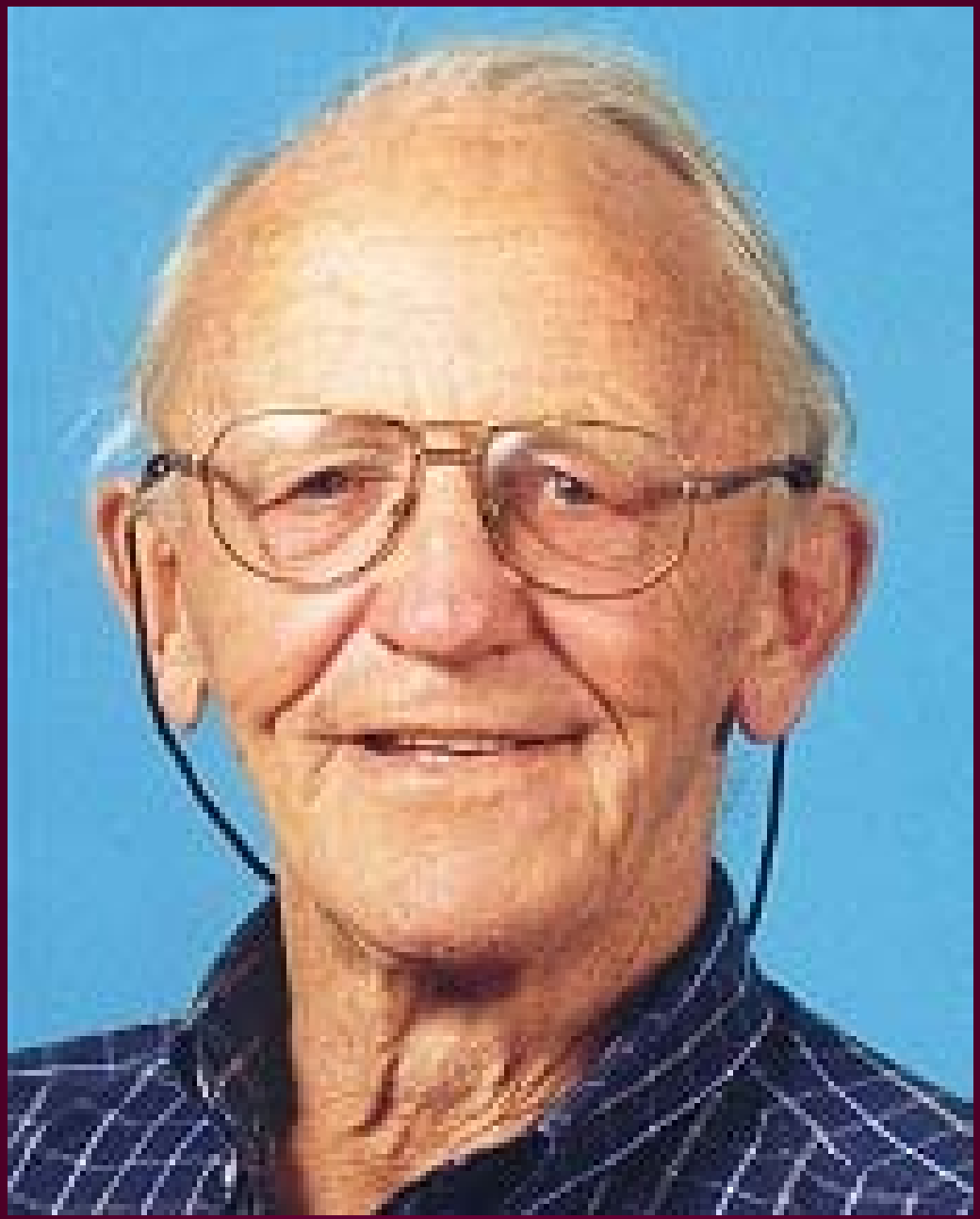

W H (Bill) Kitchen