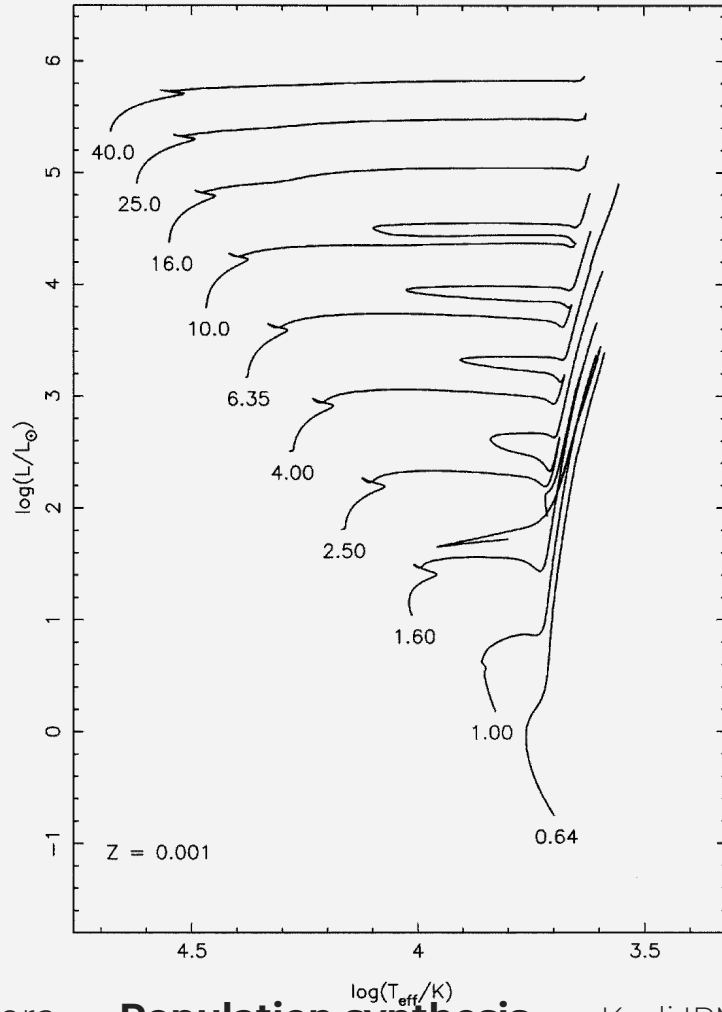


Population-synthesis

Disclaimer:

I certainly missed most of the relevant papers out there.
Please notify me and I will happily/gratefully add them
before sending around the slides :)



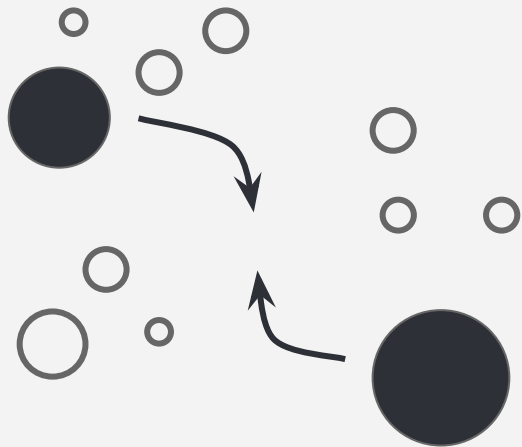
GW-sources O3 era - **Population synthesis** - Kavli IPMU, Kashiwa, Japan

Blue stragglers, enrichment, ionizing fluxes
initial mass functions, cataclysmic
variables, milli-second pulsars, ultra-
Population-synthesis
luminous x-ray binaries, star formation
rates, stellar winds, Algol systems, runaway
stars common-envelopes, luminous
red-novae, super-novae, hyper-novae,
Thorne-Zytkov objects, white dwarf
binaries, red-super giants, AGB stars etc e

Population-synthesis

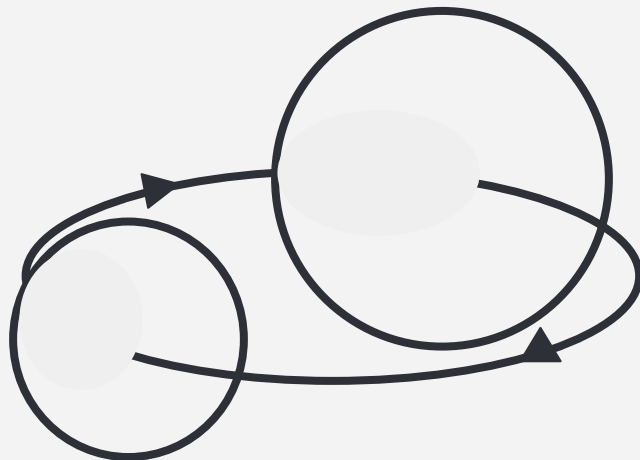
Context of gravitational-waves

dynamical formation



&

isolated binary evolution



Input

Calculate

Output

Grid, Observations,
Toy-model

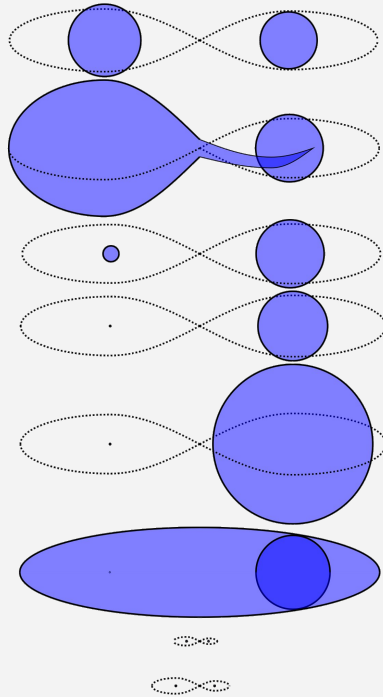
Detailed, Rapid

Model Selection,
Optimisation

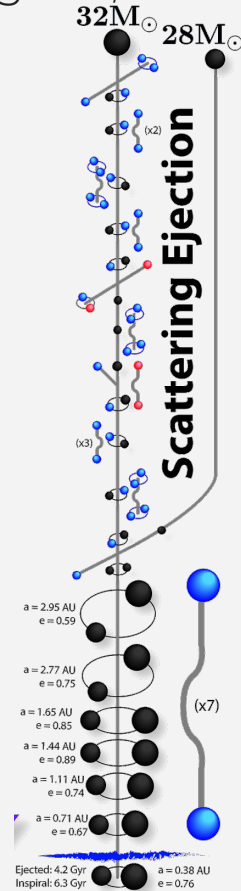
Population-synthesis

Formation Channels from Stars

Stevenson et al. 2017

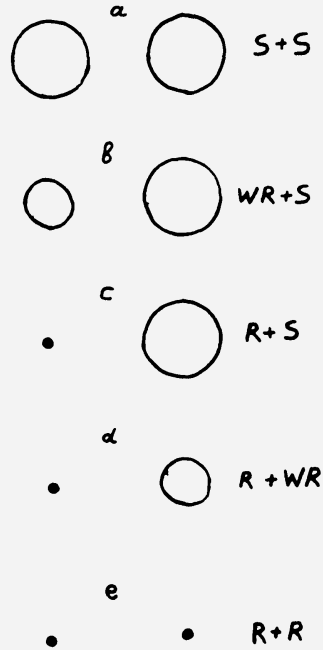


Rodriguez, Carl L. (2016)

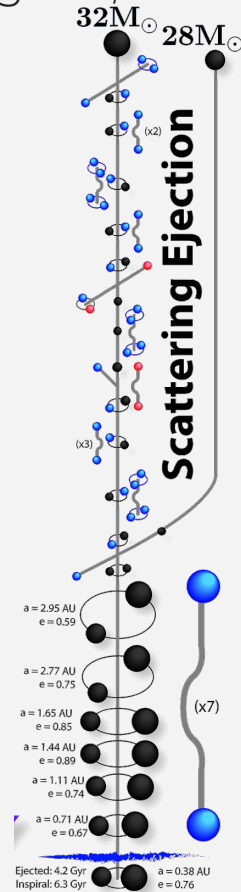


GW-sources O3 era - **Population synthesis** - Kavli IPMU, Kashiwa, Japan

Tutukov & Yungelson 1973



Rodriguez, Carl L. (2016)



Population-synthesis

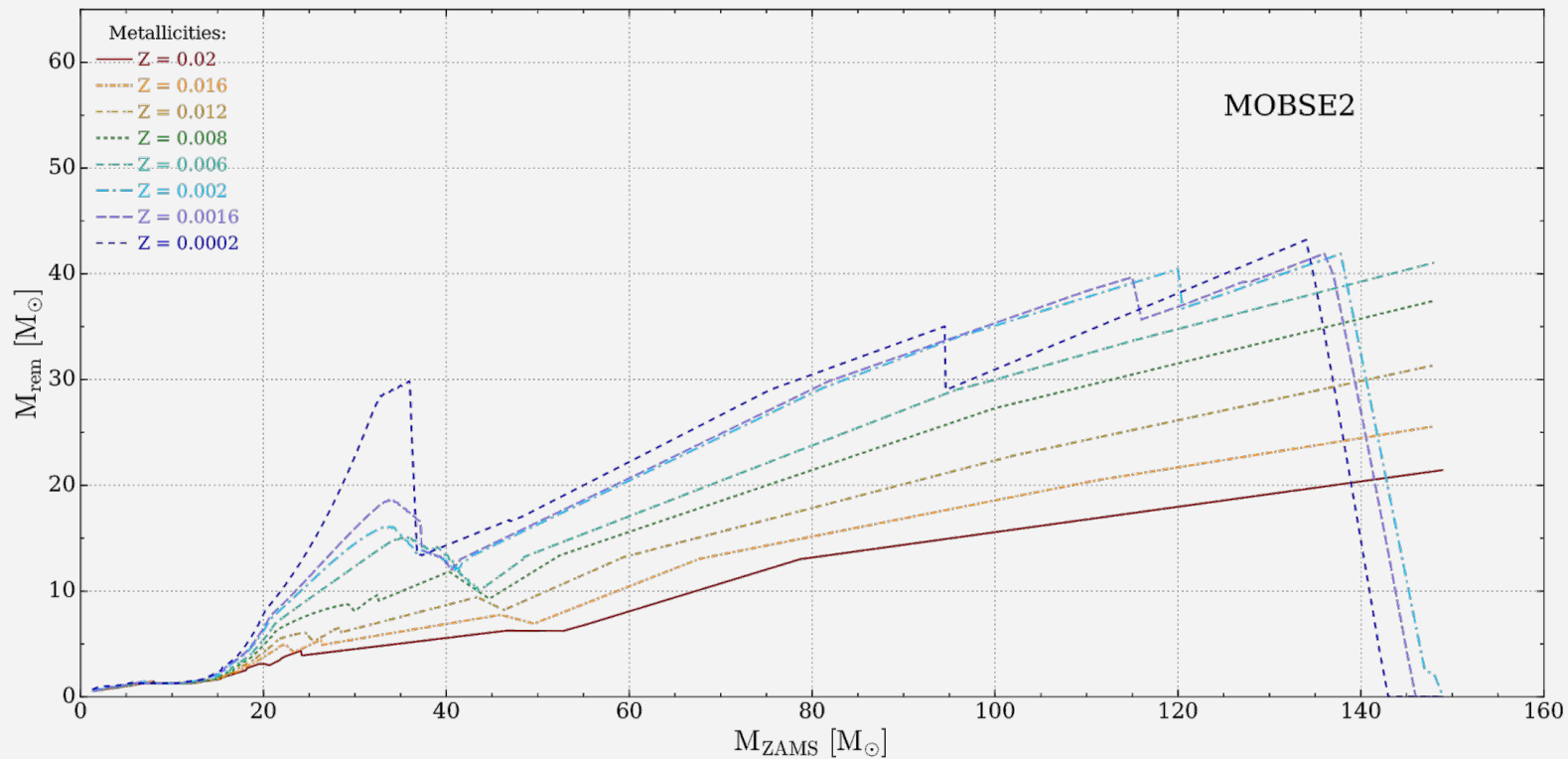
Metallicity, Kicks, Common-envelopes,
remnant masses, winds

GW150914

Example of inference

GW150914

Massive event low metallicity

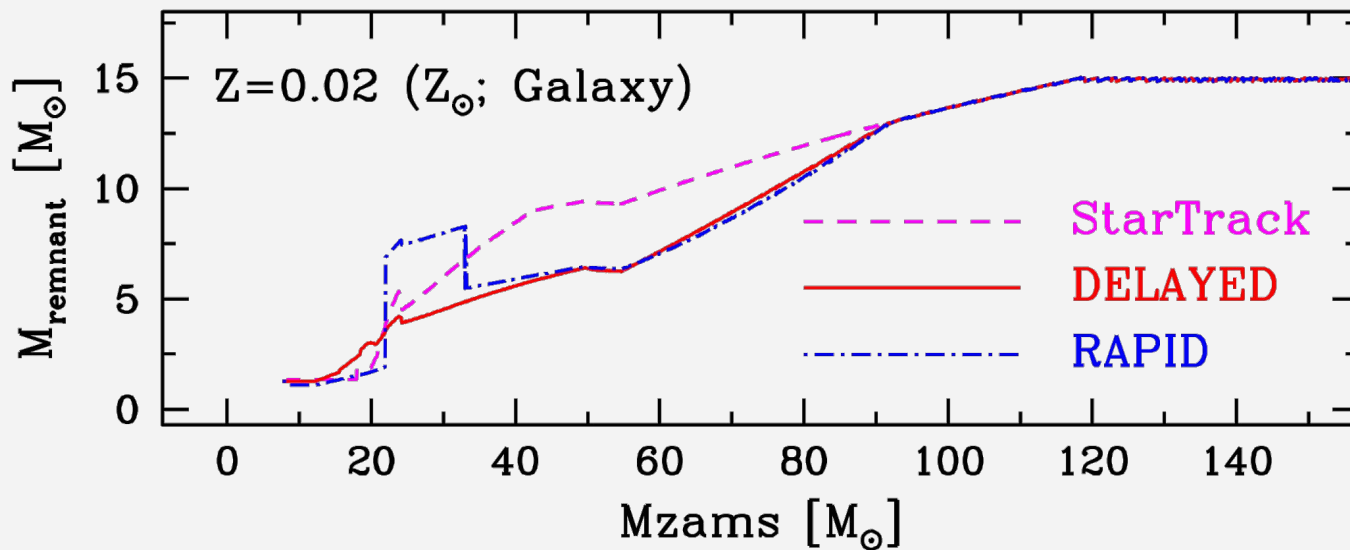


Fun Fact:
 SEVN vs MOBSE (Parsec vs Hurley)
 Giacobbo 2017

Vink et al Winds 2001

Belczynski 2010

Fryer 2012



Maeder 1995

.....

Belczynski 2010

Mapelli 2013

Marco Ziosi 2014

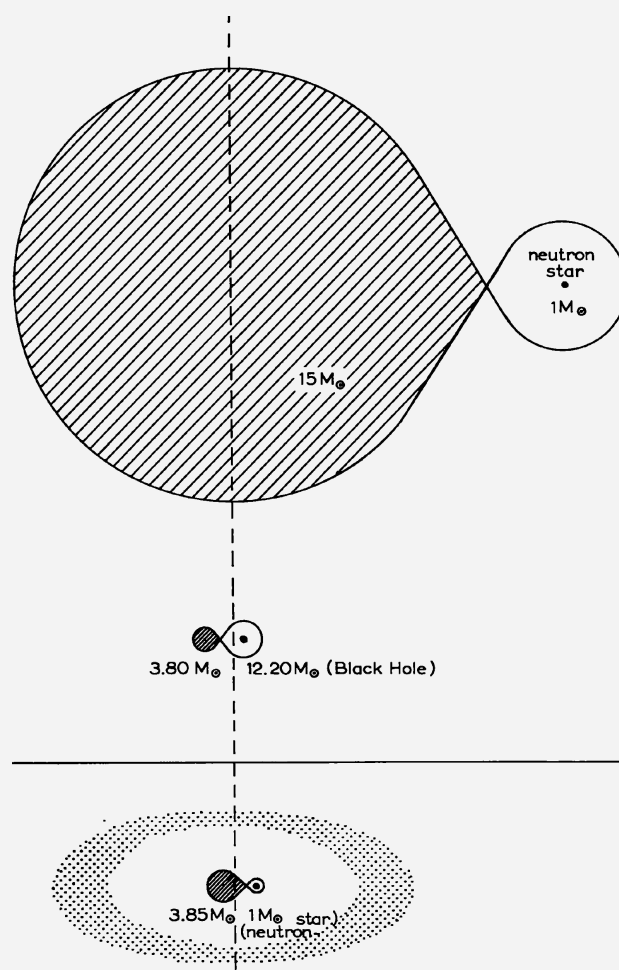
Giacobbo 2017

Stevenson 2017

Common Envelopes

Dewi & Tauris 2000
Xu & Li 2010
Loveridge 2011
Ivanova 2011
Dominik 2012
Vigna-Gomez 2018

van den Heuvel &
de Loore 1973



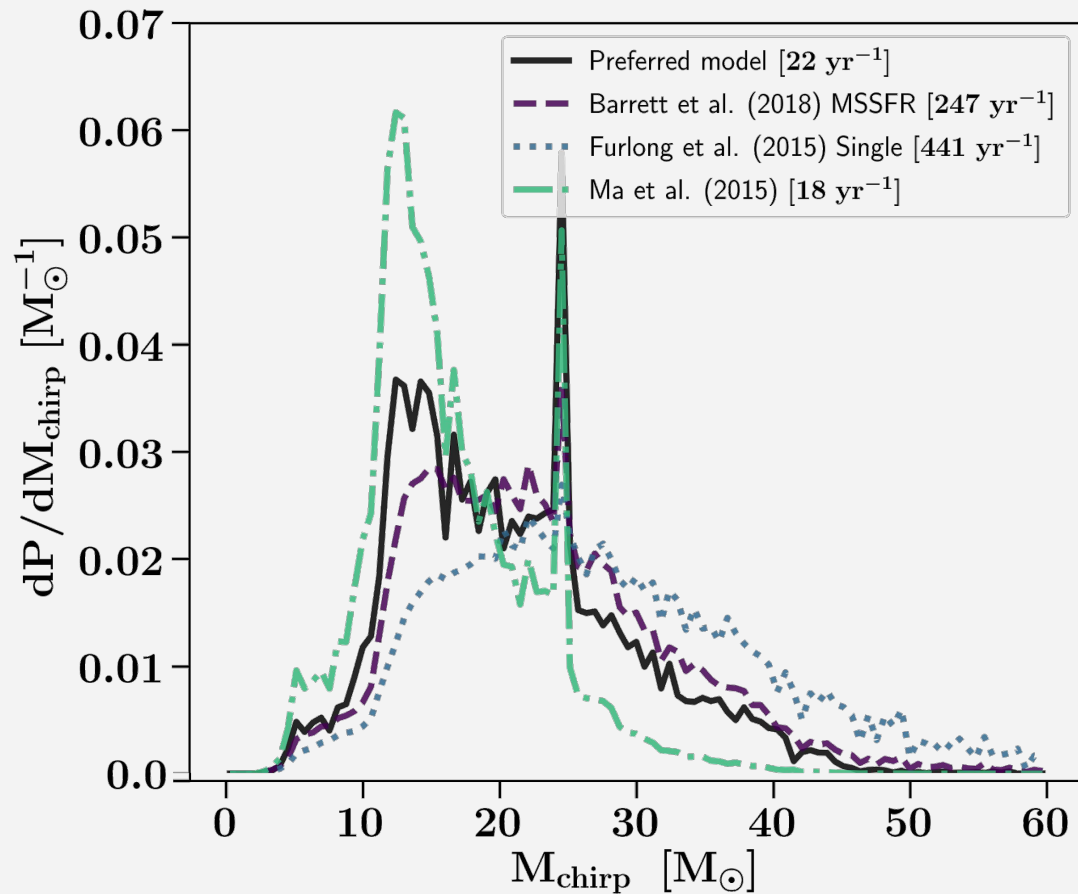
Common Envelopes

Dewi & Tauris 2000
Xu & Li 2010
Loveridge 2011
Ivanova 2011
Dominik 2012
Vigna-Gomez 2018

Optimistic
Pessimistic

Inference

Spins, Masses, Eccentricities, Features?



Inference $\mathcal{O}(100)$ observations

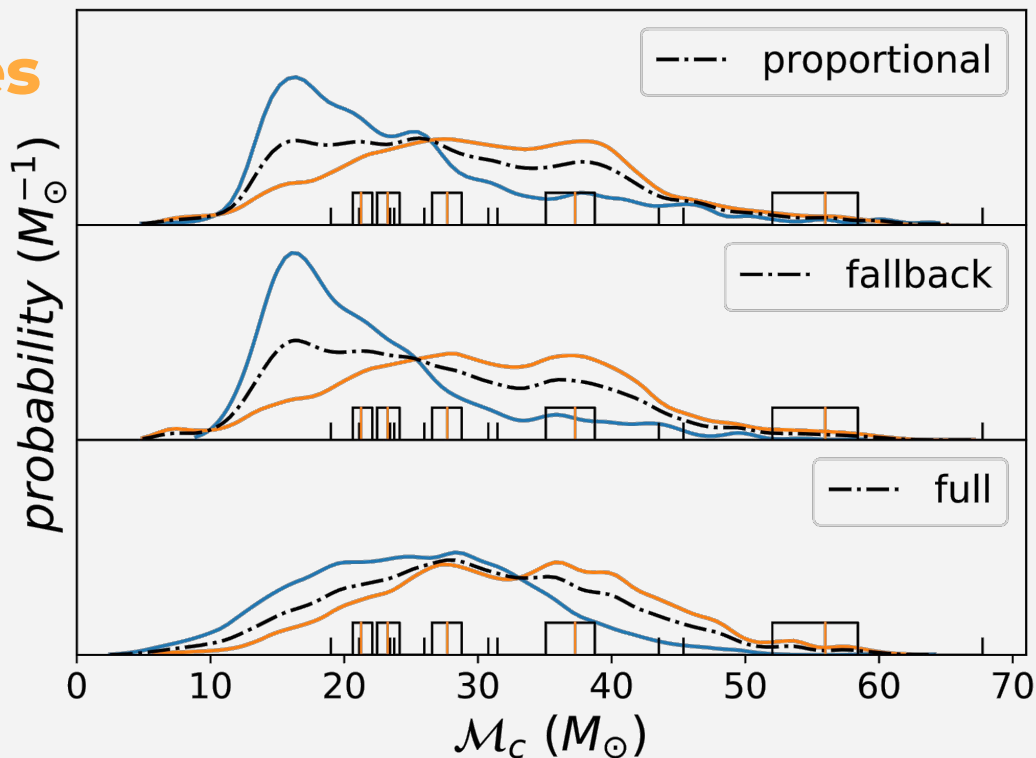
- **Isolated Binaries**
- **Cluster**
- **Combined**

Zevin

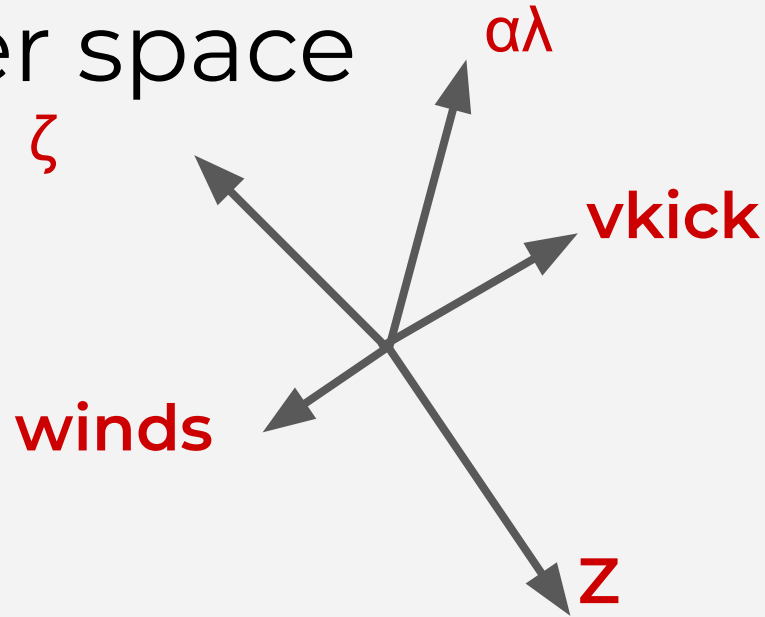
et al. 2017



Vitale et al. 2017
Stevenson et al. 2017
Talbot et al. 2017
Barrett et al. 2018
Powell et al. 2019
Arca Sedda 2019



Inference n-dimensional parameter space



Barrett et al 2018
Broekgaarden et al. 2019

