



# Applications of Bonaparte: Bayesian Networks for Victim Identification

W. Burgers<sup>1</sup>, W. Wiegerinck<sup>1</sup>, C.J. van Dongen<sup>2</sup>, K. Slooten<sup>2</sup>

<sup>1</sup>SMART Research BV, Heyendaalseweg 135, 6525 AJ Nijmegen, The Netherlands

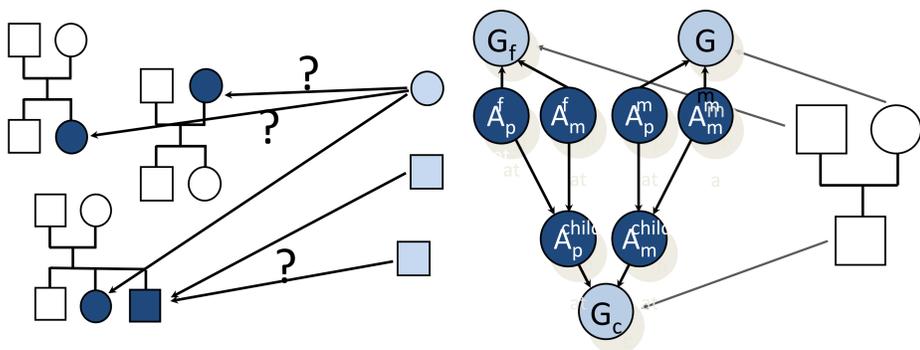
<sup>2</sup>Netherlands Forensic Institute (NFI), Laan van Ypenburg 6, 2497 GB Den Haag, The Netherlands

## ABSTRACT

We have developed software for DNA based victim identification. The software (“Bonaparte”) uses Bayesian networks for analysis. It is designed for effective handling of the identification process in case of a large disaster with many victims and can be applied in the missing person program.

## INTRODUCTION

In Disaster Victim Identification (DVI), the problem is finding matches between lists of pedigrees (which contain profiles from relatives) and lists of unidentified individuals. A measure for how good the match is, is given by the likelihood ratio.



## 2010 TRIPOLI PLANE CRASH

On May 12 2010, flight 8U771 crashed upon landing in Tripoli International Airport, Tripoli Libya. Of the 103 victims, 67 were of Dutch nationality. The NFI was asked to assist in DVI. 8U771 was the first deployment of Bonaparte. Bonaparte matched 129 of the 149 tissue samples to missing persons.



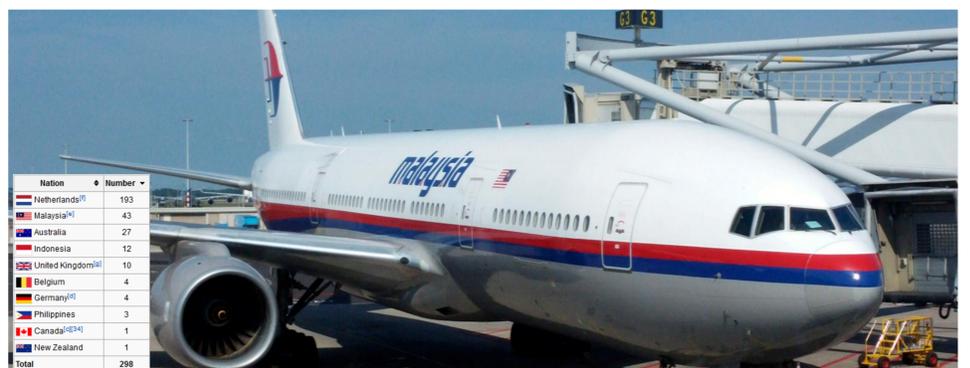
## 1953 North Sea Flood (2015)

On February 23 2015, the NFI announced that they identified the first of the remaining 32 unknown victims (out of 1,835) of the 1953 North Sea Flood. Bonaparte was used to match the DNA from a woman buried in Yerseke 60 years ago, to that of a 77 year old man; her son.

The identification is the first successful outcome of a final attempt by the Dutch Police to identify all of the remaining unknown flood victims.

## MH17 (2014-2015)

On June 17, 2014 MH17 from Amsterdam to Kuala Lumpur was shot down over Hrabove, Ukraine. All 298 passengers perished. Because 65% of the casualties are Dutch, the NFI was tasked with identification work. On 1 August 2014, the identification work started at the NFI.



The NFI received over 1,300 body parts and over 300 pedigree trees. The MH17 identification project is the largest DNA based identification project resulting from an aviation incident after 9/11.

Since 11 December 2014, 294 of the 298 victims are identified using Bonaparte.

## Utrecht Serial Rapist (2014)

In October 2014, for the first time in the Netherlands a criminal was identified using ‘Familial Search’ (Kinship analysis using first degree relatives) in the criminal database. The DNA found matched that of a man who turned out to be the brother of the perpetrator.

## Vaatstra Case (2012)

In the night from April 30 to May 1 1999, the then 16 years old Marianne Vaatstra was raped and murdered while she was traveling home by bicycle after a night out in Kollum. Investigation of the crime scene led to the discovery of a DNA trace on a cigarette lighter that probably belonged to the perpetrator. In 2012 Bonaparte was used in solving this 13 year old rape murder case. The identification followed the largest mass DNA screening operation worldwide. Around 8,000 men voluntarily donated DNA samples to be compared. After processing half of the samples Bonaparte found a match. The follow-up investigation by the Public Prosecution Service and the police lead to the arrest of a suspect on Sunday 18 November 2012 culminating in the suspect confessing the murder on December 6 2012.

