



Finding Makhubu: A morphological forensic facial comparison

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ABSTRACT

June 16, 1976, marks the Soweto Youth Student Uprising in South Africa. A harrowing image capturing police brutality from that day comprises of 18-year-old Mbuyisa Makhubu carrying a dying 12-year-old Hector Peterson. This circulated international press and contributed to world pressure against the apartheid government. This elevated Makhubu's profile with the national security police and forced him to flee to Botswana, then Nigeria, before disappearing in 1978. In 1988, Victor Vinnetou illegally entered Canada and was later arrested on immigration charges in 2004. Evasive of his true identity, the Canadian Border Services Agency and Makhubu's family believe Vinnetou is Makhubu, linking them by a characteristic moon-shaped birthmark on his left chest. A performed DNA test however, was inconclusive.

Following the continued 40-year mystery, Eye Witness News in 2016 requested further investigation. Using a limited series of portrait images, a forensic facial comparison (FFC) was conducted utilising South African Police Service (SAPS) protocols and Facial Identification Scientific Working Group (FISWG) guidelines. The images provided, presented a substantial time-lapse and generally low resolution, while being taken from irregular angles and distances, with different subject poses, orientations and environments. This enforced the use of a morphological analysis; a primary method of FFC that develops conclusions based on subjective observations. The results were fundamentally inconclusive, but multiple similarities and valid explanations for visible differences were identified. To enhance the investigation, visual evidence of the moon-shaped birthmark and further DNA analysis is required.

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1. Introduction

1.1. Case background

On June 16, 1976, was the Soweto Youth Student Uprising in South Africa. It was intended as a peaceful protest against the mounting racial policies of the apartheid government, which segregated and restricted education to its black citizens [4,55,49,35]. Between 3000 and 10,000 students were deployed by the South African Students Movement Action Committee, supported by the Black Consciousness Movement, in the township of Soweto. The protestors were due to culminate at a rally in Orlando Stadium, but heavily armed police dispersed the students, first firing teargas and later live ammunition. Many children were killed and a harrowing photograph, captured by Sam Nzima, of Mbuyisa Makhubu (18 years) carrying a fatally wounded Hector

Peterson (12 years), became an iconic example of black struggle and police violence in South Africa during that time (Fig. 1). On the same day the photograph made front page of The World newspaper [67], where it soon after circulated the international press, generating considerable global awareness and pressure against the apartheid [4,35,51,1,23].

Nzima's photograph, however, dangerously elevated Mbuyisa Makhubu's profile. His visible involvement in the uprising made him the most wanted man in Soweto by the national security police [23]. Their consistent harassment consequently forced him to flee to Botswana, where he soon after migrated to Nigeria on a United Nations scholarship for political refugees [73,62,23]. In Botswana he left behind a pregnant local teenager, Keneilwe Mokgele, who bore a son named Thato [62,23]. In Nigeria he eventually disappeared in 1978. During his last known movements, Makhubu attended a college in Warri, where he was visibly unhappy with his living conditions [17,48,23]. In his last letter to his mother dated June 1978, he complained about his poor health. The Red Cross later informed his mother that Makhubu had abandoned the school and all his possessions, amid rumours of his potential drowning, assault, disappearance and mental illness [62,23].

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Fig. 1. Mbuyisa Makhubu carrying Hector Peterson during the June 16, 1976, Soweto Youth Student Uprising (Nzima, 1976).

In 1988, an individual named Victor Vinnetou arrived in Canada using a fake Zambian passport. Vinnetou applied for refugee status, but disappeared in Toronto while manoeuvring through the bureaucratic system. In 2004 he was found and detained at a correctional facility in Lindsay, on immigration charges. According to Canada's Immigration and Refugee Board, Vinnetou had assumed multiple identities since his arrival into the country, and presented with symptoms of a mental health disorder [62,40]. Vinnetou had been evasive regarding his true identity, but admitted to being South African on 30 December 2015 to the Immigration and Refugee Board. Fears that the apartheid government were still in power and that the African National Congress had killed his parents had however made him resistant to acknowledge family connections and return to South Africa [39,11].

Peter Donaldson, an investigator for the Canadian Border Services Agency, and members of Makhubu's family, believe Vinnetou is Makhubu; linking them by a characteristic moon-shaped birthmark on his left chest [62,23]. A paternal DNA test was performed, comparing the DNA of Mbuyisa's brother Raul Makhubu with Vinnetou, where it was subsequently identified that Vinnetou and Raul did not share the same father. This result was however inconclusive, due to claims by a family member stating that Raul and Mbuyisa had different fathers. Mbuyisa's son, Thato, offered to take part in a second paternity test, but Vinnetou refused to comply [11]. After serving 12 years detention, on 13 January 2016, Vinnetou has since been released under the Toronto Bail Program [23,39,76].

1.2. Forensic facial comparison investigation

In June 2016, following the 40-year mystery that continues to haunt Makhubu's family and South Africa, journalist Mandy

Weiner via Eye Witness News (EWN) prompted further investigation into Vinnetou's identity. With no access to relevant DNA and no alternative source of identification available (e.g. dental records, X-rays, fingerprints) beyond portrait photographs, a forensic facial comparison (FFC) was pursued to enhance current intelligence. FFC is the process of comparing one face with another, via any available imagery, to determine whether they are of the same person or not. This is also referred to as a one-to-one facial image comparison or facial examination. FFC is a technique routinely used in judiciary systems within South Africa and internationally, but limited literature and guidelines that elucidate exactly what FFC is or how it should be conducted exists.

There are four known methods of FFC: holistic, photographic video superimposition, photo-anthropometry, and morphological. Holistic comparisons comprise of a quick facial review, when time constraints do not permit a complete documented facial examination, such as at custom controls at border crossings. Superimpositions involve the overlaying of two aligned images and comparing them visually with the assistance of image transitions, facilitated by video techniques or digital image processing. Image transitions include wipes (a straight line passes across one image, gradually revealing the underlying image), fades (one image progressively dissolves into the other), and toggles (images repeatedly flash from one image to the other within a short time frame). A common symptom of wipes and very slow fades is that they promote the appearance of similarities, while toggling and very fast fades emphasizes the appearance of differences [25].

Superimposition and photo-anthropometry both demand specific standardised imaging conditions to obtain reliable results [30,21,47,18,25]. Images need to be taken from an identical viewpoint, with identical lighting, aspect ratio, pose and similar expression. A sufficient resolution and focus is also required to resolve features and key landmarks, while presenting minimal compression artefacts, distortion and obscuration.

Photo-anthropometry is the measurement of dimensions and angles using biometric landmarks and other facial features in order to quantify characteristics and proportions. The common absence of a photogrammetric control (scale) imposes the use of ratios/proportions instead of absolute measurements. Ratios/proportions will however not overcome issues associated with differing focal lengths of lenses, camera-to-subject distances and angles, angles of head tilt, and lens distortions (e.g. pincushion, barrel), which all affect the relative proportion and shape of features [30,21,25]. Large-scale photo-anthropometric studies using high-resolution images based on 30 landmarks [22], 20 landmarks (11 anterior and 9 profile) [46], and 4 landmarks [12], furthermore demonstrate that photo-anthropometry has limited discriminating capabilities. The application of 3–7 landmarks on lower quality images, like CCTV, has also proven unreliable for identification and exclusion purposes [41,47]. Kleinberg and Vanezis [41] thus concluded that photo-anthropometry does not generate consistent results necessary for use as evidence in a court of law. Due to these limitations with the current science available, the Facial Identification Scientific Working Group (FISWG) [25] dictates that photo-anthropometry should not be used for FFC.

FISWG is an organisation established by experienced specialists within the field of facial identification and facial recognition systems. It coordinates an international collective that aims to construct universal standards for forensic work utilising image-based comparisons of human features, primarily the face. This thus focuses on the methods, protocols, procedures, research, technology and training to competency required. It furthermore articulates the scientific basis of facial identification by promoting documentation, collaboration, gap identification, and prioritization of specific research, development, test and evaluation topics. This information is consequently intended for dissemination to

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