Citation for Professor Anthony Figaji – College of Fellows, University of Cape Town

Professor Anthony 'Tony' Figaji matriculated from Harold Cressey High School in Cape Town in 1988 and studied medicine at the University of Cape Town (UCT), graduating with the degree MBChB in 1994. After an internship at Groote Schuur Hospital and a short period abroad, he was recruited by Professor Jonathan Peter to train in neurosurgery, obtaining the specialist qualification FCNeurosurg(SA) in 2003, together with the degree MMed(Neurosurgery) in 2005. Unsurprisingly, Prof Figaji was drawn to his mentor's field and after a fellowship in paediatric neurosurgery was appointed as a consultant at Red Cross War Memorial Children's Hospital in 2004. In 2009 he became the fourth (after Warwick Peacock, Jonathan Peter and Graham Fieggen) and now longest-serving head of the Pediatric Neurosurgery Unit at the Red Cross hospital. He rapidly showed his ability as a clinician scientist, promoted to Associate Professor (2009), Professor (2012) and then National Research Foundation (SARChI) Chair of Clinical Neurosciences (2015) – the first and only surgeon to occupy such a chair in our country. Professor Figaji leads a rapidly growing, diverse, translational, and multidisciplinary research team whose goal is to elucidate the mechanisms of acute brain injury in a range of conditions that cause disability and death in children, with a strong emphasis on the implications for clinical care and improved treatment paradigms. His work exemplifies this translational benchto-bedside approach to research, and has focused on two common and devastating conditions that affect children in South Africa: traumatic brain injury (TBI) and meningitis (in particular, tuberculous meningitis or TBM) – both contributing significantly to the global burden of disease. Professor Figaji's unit is at the forefront of advanced brain monitoring in children using a multimodal approach, in other words measuring a wide range of physiological parameters in the injured brain. He has reported the world's largest experience with monitoring brain oxygenation and brain chemistry in children, the aim of which is to understand underlying brain mechanisms of disease, produce guidelines for clinical care, and ultimately develop new therapies for acute brain injury. Over several years he has developed sophisticated infrastructure at Red Cross War Memorial Children's Hospital, creating a unique opportunity

to perform advanced clinical research in a developing world environment facing a large disease burden. The initial focus of his work was paediatric traumatic brain injury (TBI). He reported an early series of children undergoing a novel surgical intervention for uncontrolled raised intracranial pressure, which was the basis of his MMed as a registrar entitled Decompressive craniectomy for severe traumatic brain injury in children with this work cited nearly 100 times to date[1]. He pioneered multimodality monitoring for TBI in South Africa, leading to a PhD on the topic Multimodal monitoring in children with severe traumatic brain injury. The exceptional quality of this work was recognised with the Bronte Stewart Research Prize for the most meritorious PhD thesis in the Faculty of Health Sciences, as well as a the UCT Fellows' Award in 2008 and the Raimondi Award of the International Society for Pediatric Neurosurgery in 2009[2]. Most significant of all, the active approach to managing children with TBI that characterised this period saw a fall in mortality of severe TBI from over 50% to around 12%, truly an astonishing example of the beneficial impact of research on clinical care. Perhaps the most surprising finding of this work was that brain hypoxia is common in children with severe TBI despite apparently sufficient clinical care (based on published guidelines) and that intracranial pressure (on which most clinical protocols are based) has a variable relationship with perfusion of the brain[3] – in other words, monitoring only blood pressure and intracranial pressure may be quite misleading in treating patients with severe TBI[4]. His subsequent work in paediatric traumatic brain injury (TBI) has built on this foundation in advancing our understanding of brain pathophysiology and the implications for clinical care[5], leading to the largest international experience with

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advanced methods such as brain oxygen monitoring and microdialysis in children, with more than 300 children having undergone advanced monitoring. The value of this was highlighted in the recent NIH-funded ADAPT trial where of 50 participating centres worldwide, the Red Cross War Memorial Children's Hospital had the highest rate of advanced brain monitoring (as defined currently by a brain oxygen monitor), and almost 40% of the brain oxygen monitored patients in the trial were from that one centre. His current work in TBI explores targeted biomarker analysis, unbiased proteomics biomarker discovery in brain interstitial fluid, and the interplay of genomics and outcome[6][7][8]. The start of Prof Figaji's consultant career coincided with the advent of endoscopic treatment for obstructive hydrocephalus, and he soon put his mind to the application of this new technology in the treatment of hydrocephalus due to paediatric tuberculous meningitis (TBM). He re-introduced an almost forgotten radiographic investigation, air encephalography[9], in developing a simple clinically reliable algorithm to distinguish communicating from noncommunicating hydrocephalus – the former not benefitting from the procedure of endoscopic third ventriculostomy (ETV), and was the first to describe the use of ETV in TBM[10], as well as highlighting the technical challenges of the procedure[11]. This work brought Professor Figaji to the attention of the Tuberculous Meningitis International Research Consortium, a global consortium of

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researchers collaborating to address research priorities in TB meningitis[12][13]. His group was able to show differences in brain-derived and blood-derived biomarkers in different compartments of the central nervous system[14] with imaging studies disclosing possible reasons for these compartmental differences[15]. Noteworthy recent findings include recognition of a transcriptomic brain signature in TB meningitis characterized by neural injury and excitoxicity, and a distinct molecular difference between the transcriptome of ventricular cerebrospinal fluid compared with time-linked spinal cerebrospinal fluid[16]. Other work includes measuring rifampicin concentrations at standard doses in ventricular CSF and brain tissue microdialysis[17] as well as measuring inflammatory mediators directly from brain interstitial fluid using a highly innovative purpose-made system. In summary, Professor Figaji has studied tuberculous meningitis as a clinical model of brain injury in meningitis[18] and his group is exploring similarities with other forms of brain injury in children, including the development of secondary injury mechanisms such as brain inflammation and ischemia, the role of biomarkers of injury, and implications for management[19] and long term outcome . Rohlwink UK, Donald K, Gavine B, Padayachy L, Wilmshurst JM, Fieggen G, Figaji AA. Clinical characteristics and neurodevelopmental outcomes of children with tuberculous meningitis

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and hydrocephalus. Dev Med Child Neurol. 2016 May;58(5):461-8. This unit is now the leading centre globally for studying this disease using advanced brain monitoring techniques and his current work extends to using site-of-disease specimens to perform proteomics, transcriptomics, and drug recovery using brain microdialysis. In addition to funding received from the NRF, he has been supported by the Oppenheimer Memorial Trust, by the SAMRC and Gabriel Foundation through a novel co-funded grant, and the UK NIHR through the Global Neurotrauma Initiative. It is important to note that Professor Figaji has developed this highly productive research program while leading a nationally unique and clinically demanding service that requires a 24-hour day cover, given the nature of neurosurgery. He also leads the paediatric brain tumour neurosurgical service and has introduced sophisticated intraoperative neurophysiological monitoring to enable safer, more aggressive surgery to be performed in South Africa. He is closely involved in registrar teaching and training, as well as research supervision with an astonishing 45 past or current postgraduate students ranging from honours to doctoral (eight). The interests described above span the two key research domains of the interdisciplinary Neuroscience Institute, namely brain injury and brain development across the lifespan, and Professor Figaji's research program is unquestionably a central pillar of the NI. He has taken an important leadership role in the NI through establishing a biobank (based on his experience doing so at RCWMCH) as well as equipping the basic neuroscience lab (largely funded through his grants) and serves as Lead for the Neuroscience Platforms Working Group. Professor Figaji's contributions to the field of neurotrauma have been recognized through election as president of the International Neurotrauma Society (2016-2018) and his appointment as Pediatric Lead for the US-based Brain Trauma Foundation (2020-present), the most influential neurotrauma organisation worldwide. His scientific leadership has seen him elected as scientific chair for various organisations, including the International Society for Pediatric Neurosurgery (ISPN), the Society of Neurosurgeons of South Africa (SNSA), and Scientific Chair of the 18th World Congress World Federation of Neurosurgical Societies. Other leadership roles include serving on the Executive Board of the International Society for Intraoperative Neurophysiology (ISIN), secretary of the ISPN (current), and president-elect of SNSA

(current). Furthermore, he is the first – and so far the only – surgeon to be inducted as a Member of the Academy of Sciences of South Africa; and was recently awarded a B-1 rating by the NRF. I believe Professor Figaji's outstanding contributions to knowledge in previously neglected areas of study, scholarly leadership and record as an inspirational role-model meet the requirements for the award of a Fellowship by the UCT College of Fellows.

Thank you for giving this nomination your consideration,

Professor Graham Fieggen

Helen & Morris Mauerberger Chair and Head, Division of Neurosurgery Head, Department of Surgery Director, Neuroscience Institute Key references