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VIEWPOINT

VOICES IN CARDIOLOGY

Bax and Mackenzie

Two Knights, One War, and a Lost Legacy

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Hanging by the fireplace at the Royal Academy of Music is a portrait of Sir Arnold Bax (1883-1953). Bax was a prolific British composer whose output equals that of Elgar, Holst, and Vaughan-Williams in quantity, harmonic complexity, and descriptive power, and yet his legacy remains meagre. Many factors influence legacy, but among the most potent is an individual's visibility in life.[1]

The portrait provides the touchstone to understanding Bax as a person. One of few color likenesses of Bax, it was painted in 1933 by Vera Bax, his sister-in-law when Bax was 50 years old. Bax and Vera were close and likely because of this connection, Vera paints the man she sees, diligently recreating his malar flush, and providing a vital clue to the diagnosis that shaped Bax's life and his ability to maximize the impact of his own artistic output.[2] A close up of Bax's face from the portrait is shown in **Figure 1**.

Bax was born in 1883 to wealthy parents, making an artistic life available to both Arnold and his brother Clifford, a celebrated writer. Educated at home until admitted to the Royal Academy of Music in 1900, Bax was slightly built and described as a "frail child." Bax grew up outside a school regimen, playing garden cricket with his brother and tutor.[3] During his childhood, 2 clinically relevant incidents are documented: once collapsing at the cricket stumps on a hot day and once being seen by a doctor in Malvern who is reported to have described Bax as being in a state of advanced cardiac failure aged 18 years. Both of these incidents are nondiagnostic.[4]

Bax remained physically reasonably fit in his twenties. He regularly bicycled 5 miles on the flat from Beaconsfield to meet Harriet Cohen, CBE, at Amersham, climbing a fairly steep hill to meet her train from London.[5]

Throughout his autobiography *Farewell, My Youth*, Bax sustains clever deflection about his own health. But he gives himself away in the foreword when he writes about "the tragi-comedy of the body! I resent the buzzing of blood in my temples whenever I stoop to tie a shoelace or pick up my pen from the floor: the thickening of tissue beneath the skin in front of my ears and under my chin; the degrading fact that in order to rise from my deep arm-chair I needs must huddle my trunk forward and lever myself up by pressing hard upon the arms."[6]

Also poignant is specific mention made by his brother Clifford in a biographical note of Bax's response to being Knighted in 1937: "…he accepted the honour with his usual modesty and, I presume *his usual palpitations*." Clifford also reveals the reduction in Bax's exercise capacity when at age 54 "cricket, hockey and tennis have become happy memories."[7]

These indicative facts and Vera's honest portrait shed light on, but do not clarify, the diagnosis that underpins the physiological arc of Bax's life. The differential diagnosis so far includes most causes of pulmonary hypertension, including valvular heart disease, with the absence of an illness suggestive of rheumatic fever being an important negative.[8]

In 1914, war hit Europe, and men of fighting age were first encouraged to sign up and then conscripted to go to the front. In July 1915, Bax is examined by Dr Lewis G. Glover of Belsize Park Hampstead.[9] Glover declared Bax unfit for military service due to his "nervous temperament," providing no useful diagnostic information.

Fortuitously for Bax scholars, diagnostic conjecture ends in 1916 when Bax is examined by another knight of the realm, Sir James Mackenzie, FRSM.

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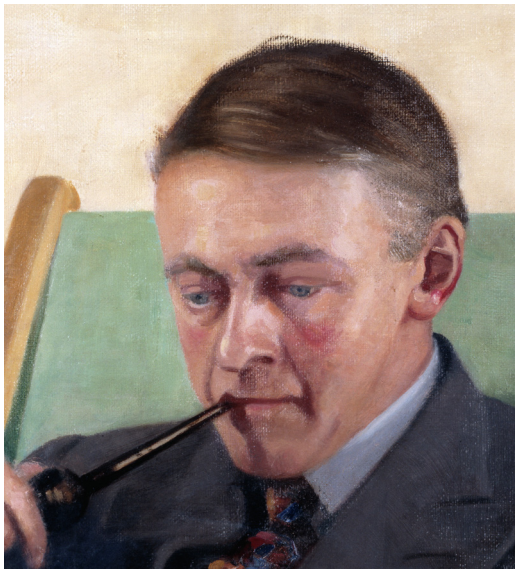
FIGURE 1 Close-Up of Bax's Face From the Portrait in Oil by Vera Bax, 1933



Bax's malar flush evident at age 50 years. Image reproduced with permission from the Royal Academy of Music, London.

Mackenzie was the pre-eminent cardiological opinion of the early 20th century.[10] His clinical skill is recognized today through the Mackenzie medal, the highest honor awarded by the British Cardiovascular Society.[11] The Sir James Mackenzie Cardiological Society also was the seed group for the American College of Cardiology, this journal's alma mater.[12]

Mackenzie's brilliance lay in meticulous observation. Trained as a general practitioner in Edinburgh, he perfected cardiological examination describing precisely, and only, what he observed.

Mackenzie had deep experience of rheumatic heart disease. He built upon Cushny's observation of the relationship between fibrillation of the atrium and a grossly irregular pulse, using his polygraph machine to describe loss of the "a" component from the jugular venous pressure wave suggesting loss of active atrial contraction.[13] Mackenzie named this phenomenon auricular paralysis, later becoming atrial fibrillation.[14] In 1904, Mackenzie used Dudgeon's sphygmograph machine to identify premature ventricular contractions, which he termed extrasystoles, establishing modern terminology.[15]

The lives of these 2 knights intersected on the 14th of September 1916 at 133 Harley Street. Mackenzie was advanced in his career and engaged by the War Office to investigate the condition known as soldiers' heart in men returning from the front.[16] At the request of the War Office, Mackenzie published a memorandum in the *British Medical Journal* to guide medical examiners required to assess army recruits.[17] It is likely that this is why Bax sought Mackenzie's opinion following Glover's less diagnostic review in 1915.

Mackenzie's examination findings were typed up and signed in ink "J Mackenzie FRSM." The report is later stamped with 2 official stamps of the National Review Board dated first the 29th January 1917 and then 22nd of June 1918, reflecting the annual review of men eligible for military service at this time. On Bax's death in 1953, Harriet Cohen meticulously curated his papers, preserving this pivotal document in the British Library.[18]

Mackenzie's clinical findings remove any doubt about Bax's cardiac diagnosis, and they read as follows:

> *"I certify that I have examined Mr Arnold Bax. He is manifestly a very nervous man, and suffers much from palpitation and breathlessness on very slight exertion. During the examination his pulse was very excitable, and at times very irregular, the irregularity being due to frequent occurrence of extra-systoles. The apex beat was large and diffuse, and extended one inch beyond the nipple line; there was a rough systolic murmur best heard at the base. He also suffers from a curious mental condition in which there is fear of being in enclosed spaces (claustrophobia). These symptoms point to a condition of ill health that renders him in my opinion totally unfit for military service. J Mackenzie, MD."*

Mackenzie's findings are diagnostic of a ventricular-septal defect large enough to cause left ventricular dilatation with displacement of the apex beat, arrhythmias, and exercise intolerance. The report makes abundantly clear the physiological impact on Bax at age 33 years. Mackenzie is forensic in his clinical assessment of Bax leaving little room for differential diagnosis. Significantly, Mackenzie did not observe pathological V waves in the jugular venous waveform, effectively ruling out pathologies arising from or associated with tricuspid regurgitation. The precise description of the location and timing of the murmur effectively removes the possibility of mitral valve disease in which Mackenzie was an acknowledged expert.[19]

Mackenzie's findings are borne out by Bax's gradual alteration of his lifestyle from his forties onwards, walking short distances and stopping frequently to pause as described in a first-hand account given by his later companion Mary Gleaves.[20]

Bax's compositional output was formidable, totaling over 250 works including 7 symphonies.[21] His seventh symphony written in 1939 marked the end of his most prolific compositional period and points to a step change in his function. This would be pathophysiologically consistent with intracardiac shunt reversal, severe pulmonary hypertension, and low oxygen saturations.[22]

The composer Eric Coates described Bax's compositional power as his ability to write for each instrument of the orchestra as if he played the instrument himself.[23] Bax was knighted for services to music in 1937 and was advanced to Knight Commander of the Victorian Order in 1953.[24,25] Bax was widely appreciated by the musical establishment in his lifetime, being awarded 3 honorary doctorates from the Universities of Oxford, Durham, and the National University of Ireland in 1934, 1935, and 1947, respectively.[26-28].

If measured only by skill, Bax's legacy should equal that of other giants of British music. But although intellectually and artistically endowed, his progressive cardiac frailty would have made public engagement and performance initially hard to tolerate and later impossible. Palpitations and breathlessness made him nervous of the stage, never once delivering a public speech in his lifetime.[29] The act of conducting his own symphonies would have been incompatible with his exercise intolerance.[30]

At the time of Bax's death, he was visiting Ireland to examine at Cork University College. On the day of his death, Bax was taken to Kinsale Head by his friend John Horgan to view the sunset. Later that evening being driven to the home of composer Prof Aloys Fleischmann, Bax complained of feeling intensely cold and was reported to look seriously ill.[31] According to the account of the local coroner, Bax walked unaided up the stairs, breathing heavily with overt central cyanosis. Bax was attended by Prof James Donovan who declared Bax to be terminally ill, diagnosing "coronary thrombosis"; Bax politely thanked him for coming and died a few minutes later.[32]

This description of Bax's final moments is not consistent with acute coronary ischemia, given the absence of chest pain; it is however compatible with end-stage pulmonary hypertension.[33] Bax's death certificate states "cardiac infarction" as his cause of death, which we can now conclude to be incorrect.[34]

These findings serve to challenge the rhetoric that Bax's frailty and facial appearance was due to excessive alcohol consumption. Alcohol is a systemic vasodilator, which in excess causes a significant fall in cardiac output, exacerbating shunting, and worsening hypoxemia.[35] We must also consider that Bax continued to compose despite his progressive hypoxemia, writing a march for Her Majesty Queen Elizabeth the Second's coronation <1 year before he died.[36] Given Mackenzie's findings, we must reappraise the likelihood that Bax's later career was affected by alcohol. This is concomitant with current European Society of Cardiology guidance on alcohol intake in pulmonary hypertension.[37]

There is no documentation of Bax complaining about his symptoms.[38] Three months before he died on October the 3rd, 1953, his writing becomes suddenly erratic, likely reflecting hypoxemia. Bax's letters make it clear that he felt death approaching as his symptoms progressed to their termination.[39]

A century after their lives crossed, we must celebrate these 2 remarkable knights of the realm, both as testament to a quiet life-long struggle against congenital cardiac disease, and to remind us that assumption is dangerous in life and lethal in medical practice.

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