

# THE CODE

'The Code' is a three movement work and winning entry for A4 Brass Quartet's composition competition 2019. The music is written to celebrate the 50th anniversary of the Apollo 11 lunar landing and focusses on one of the foremost minds behind the project: Margaret Hamilton.

Margaret Hamilton was the Director of Apollo Flight Computer Programming at the Massachusetts Institute of Technology. As well as being widely considered the "mother of software", she is responsible for developing the on-board flight software for the Apollo space programme.

The work is structured in three movements:

## Movement I: "Source Code"

This movement begins with our source code, which is represented by a binary two note motif. As the code is written, the two note pattern gradually expands into a complex interweaving texture. Discordant references to Copeland's 'Fanfare for the Common Man' sing out to illustrate Hamilton's struggle for success and recognition in a male dominated industry. (1'30)

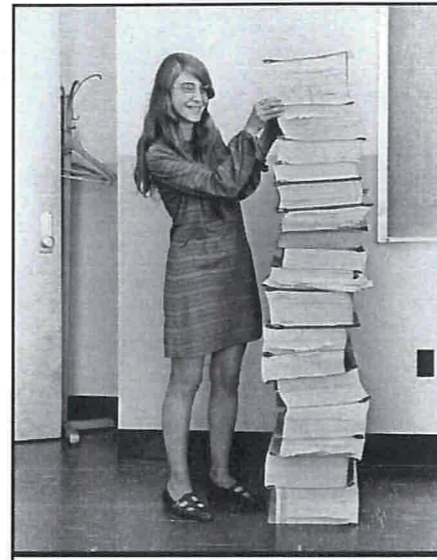
## Movement II: "Moonlit Sonnet"

Hamilton dedicated an incredible amount of time to her work on the project. Often, she would bring her young daughter to the MIT lab and regularly work throughout the night. This chorale movement uses the structure of a Shakespearean sonnet (14 stanzas) in a romantic ode to the celestial body she was yearning to reach. (2'30)

## Movement III: "Colossus"

The name of this movement takes its name from the Apollo Guidance Computer (COLOSSUS AGC), that Hamilton created. The movement uses a pitch matrix, which is based upon small numerical portions of an extract from the AGC's original source code (see page 4). Four combinations are used: 751630, 141060, 475150 and 347141. In essence, the quartet actually play the source code, that Hamilton herself developed.

During the Apollo 11 mission the computer started displaying worrying error messages at the critical end phase of the spacecraft's journey to the moon. The error messages arose because the computer was being overwhelmed with a series of unnecessary calculations. At this point, its capacity was most needed to land the lunar module on the surface of the moon. Due to Apollo's unique asynchronous processing (which Hamilton and her team created), the computer would focus on the most important task at hand: landing the lunar module on the Sea of Tranquility. When the software discovered it didn't have enough capacity to do all the functions it was supposed to be doing, it went through its error detection process and focused on the highest priority task. Thanks to Hamilton, man successfully landed on the moon. (4')



Hamilton in 1969, standing next to listings of the software she and her MIT team produced by hand for the Apollo project.

This work is dedicated to Margaret Hamilton, not only for her extraordinary work as a leading figure behind the historic Apollo 11 mission but also as an inspirational woman in her own right.

Many thanks and I hope you enjoy my music,

Andy Wareham  
February 2019.

Duration: 7:45 (approx.)

The work was composed for A4 Brass Quartet's composition competition 2019.

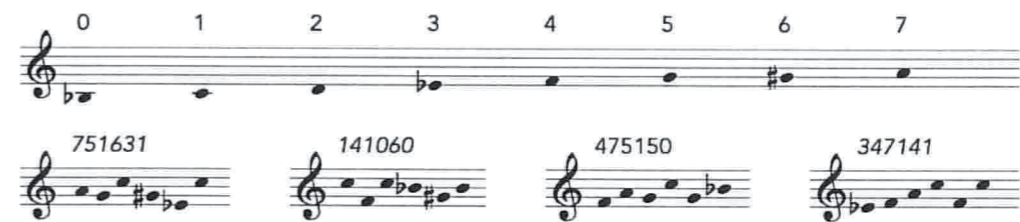
### Pitch Material:

Extract - Octal Listing from Apollo Guidance Computer: Colossus

141060, 751471, 475150, 347141.

ASSEMBLY REVISION 249 OF AGC PROGRAM COLOSSUS BY NASA 2021111-041										20'35 OCT. 28, 1968	PAGE 1888
OCTAL LISTING FOR PARAGRAPH 1312, WITH PARITY BIT IN BINARY AT THE RIGHT OF EACH WORD, A'S DENOTES UNUSED FIXED MEMORY											
ALL VALID WORDS ARE BASIC INSTRUCTIONS EXCEPT THOSE MARKED A'S (INTERPRETIVE OPERATOR WORDS) OR C'S (CONSTANTS)											
36,3000	C'	64311 0	I'	77776 1	33244 0	03216 1	34710 0	03211 0	13013 1	12502 0	
36,3010		33245 1		03231 1	12502 0	33246 1	03205 0	12502 0	33247 0	03231 1	
36,3020		12502 0		06006 1	I'	77650 1	C'	03783 0	I'	77624 1	C'
36,3030		05131 1		34712 1		05132 1		33243 1	03231 1	13033 0	06006 1
36,3040	C'	00001 0	C'	01133 1	I'	53025 0	C'	31687 1	C'	75053 0	I'
36,3050	I'	53125 0	C'	31725 0	C'	75064 1	I'	43145 0	C'	31731 0	C'
36,3060	I'	77752 1	I'	05301 0	C'	00047 1	C'	31727 1	I'	56325 0	C'
36,3070	C'	00001 0	C'	00001 0	C'	05070 0	C'	17527 1	C'	30700 0	C'
36,3100	I'	07206 1	C'	03076 0	I'	56205 0	I'	41257 1	C'	20165 1	C'
36,3110	C'	03413 1	I'	77776 1		33242 0		03231 1		13112 1	
36,3120		06006 1	I'	77624 1	C'	05055 1	I'	53575 0	C'	03656 1	I'
36,3130	I'	74315 0	C'	03746 1	C'	31742 1	I'	50255 0	I'	00015 0	C'
36,3140	C'	03746 1	C'	03656 1	I'	71340 1	C'	75147 1	C'	31746 0	I'
36,3150	C'	31750 1	I'	77756 0	C'	16732 0	I'	43146 0	C'	03686 1	C'
36,3160	C'	03700 0	C'	36746 1	C'	24737 1	I'	43014 0	C'	01267 0	C'
36,3170	I'	77626 0	C'	00362 0	C'	00037 0	I'	77615 0	C'	03716 1	C'
36,3200	C'	03672 1	C'	37646 1	C'	73005 0	I'	77650 1	C'	75183 1	
36,3210		34712 1		05415 1		15112 1		01762 0		13240 0	
36,3220	C'	20763 1		14106 0		13225 0		13227 1		01733 1	
36,3230		10003 0		00006 1		23762 0		04555 0	C'	20624 0	
36,3240		51762 0		10001 1	C'	01441 1	C'	01006 0	C'	01475 0	C'
36,3250	I'	77620 0	C'	02317 0	I'	00370 0	C'	00088 1	C'	00051 0	C'
36,3260	C'	00052 0	C'	00006 1	I'	63775 1	C'	03502 0	C'	02467 0	C'
36,3270	I'	52717 1	C'	02555 0	C'	75032 1	I'	12745 1	I'	77775 1	C'
36,3300	C'	75032 1	C'	12745 1	I'	77700 0	C'	75304 1	I'	43104 0	C'
36,3310	I'	77775 1	C'	15332 1	C'	02737 0	I'	77201 1	C'	00001 0	C'
36,3320	I'	47515 0	C'	02731 0	I'	76234 0	C'	45562 1	I'	47515 0	C'
36,3330	I'	77171 0	C'	03526 0	C'	00000 1	C'	01257 0	I'	40151 0	C'
36,3340	I'	77654 0	C'	75350 0	I'	40112 1	C'	75350 0	C'	01262 0	I'
36,3350	I'	01551 1	C'	01257 0	I'	75405 1	C'	01262 0	I'	76257 0	C'
36,3360	C'	00050 1	C'	77775 1	I'	77134 1	C'	02215 0	C'	00242 0	I'
36,3370	C'	03456 0	I'	00351 0	C'	01257 0	C'	00047 1	I'	05345 0	C'

### Pitches:



### Performance Notes:

#### Mutes Required

- Cornet - Cup mute
- Tenor Horn - Cup mute
- Baritone - No mutes required
- Euphonium - No mutes required

# The CODE

Andy Wareham

Brass Quartet

Winner of the 2019 A4 Quartet Composition Competition



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## ANDY WAREHAM

Andy Wareham (B. 1994) is a young composer hailing from Southampton, England. His musical journey began at the age of six under the tuition of Lesley Milam and ever since then he has aspired to become an accomplished composer of music. He has become a keen academic and conductor within the Welsh & English brass band movements.



Andy has written a wide variety of music, published by a range of publishing houses. He has won a number of awards for his compositions, including the 'Vivendi Composition Award' and 'Best Student Composition' at the 2016 University Brass Band Championships of Great Britain. In May 2017, Andy won the Cory Band's composition competition with his piece "Tarot! Tortuous Tarot!".

Andy currently holds a position as 'Young Composer in Residence' with the world famous Black Dyke Band. As part of the residency he is working under the guidance of Black Dyke's 'Composer in Residence', Professor Philip Wilby and their Musical Director, Professor Nicholas Childs.

After graduating from Cardiff University as a Bachelor of Music (Hons), Andy went on to study as a Master of Music (Hons) at the Royal Welsh College of Music and Drama. He was accepted as RWCMD's first Brass Band Conducting student and studied under the guidance of Dr Robert Childs. Following two years of conducting the RWCMD Brass Band he graduated in July 2018 and directed the band one final time at his own graduation ceremony.

# THE CODE

Winner of the A4 Brass Quartet Composition Competition 2019

Movement I:  
SOURCE CODE

ANDY WAREHAM

Computerized (♩=144)

The musical score is written for four parts: Cornet, Tenor Horn, Baritone, and Euphonium. It is in 4/4 time and marked 'Computerized (♩=144)'. The score begins with a dynamic of *p* and a four-measure phrase. The Cornet part has a dynamic of *f* and a marking of *p sub., cresc. poco a poco*. The Tenor Horn part has a dynamic of *f* and a marking of *p cresc. poco a poco*. The Baritone part has a dynamic of *f*. The Euphonium part has a dynamic of *f*. The score is marked with a large 'COPYRIGHT' watermark.

13

Cor. *p*

T. Hn. *p*

Bar. *ffp* *ff* *p sub.* *ff* *p sub.* *ff* *p sub.* *ff* *p sub.* *ff*

Euph. *ff* *p* *ff* *p sub.* *ff* *p sub.* *ff*

17

20

Cor. *f* *p* *ff* *f* *mp*

T. Hn. *f* *p* *ff* *f* *mp*

Bar. *ffp* *f* *mp*

Euph. *ffp* *f* *mp* *f* *mf*

21

Cor. *mf* *fp* *pp* *ff*

T. Hn. *mf* *mp* *fp* *pp* *ff*

Bar. *mp* *fp* *pp* *ff*

Euph. *mp* *fp* *pp* *ff*

25

Cor. *p* *f*

T. Hn. *p* *f*

Bar. *p* *f*

Euph. *Solo* *mf* *ff* *mf* *ff* *f* *ff* *f* *ff*

29

Cor. *p sub.* *f*

T. Hn. *p sub.* *f*

Bar. *Solo* *ff* *Non-solo* *p sub.* *f*

Euph. *f* *p* *f*

33

Cor. *p sub.* *mf*

T. Hn. *mf*

Bar. *mf*

Euph. *mf*

37

Cor. *f*

T. Hn. *f*

Bar. *(octavo basso)* *ff* *mf* *f*

Euph. *(octavo basso)* *ff* *mf* *f*

41

44

Cor. *ff* *f*

T. Hn. *ff* *f*

Bar. *(octavo basso)* *ff* *f* *ff*

Euph. *(octavo basso)* *ff* *f* *ff*

45

Cor. *mf* *ff*

T. Hn. *mf* *ff*

Bar. *mf* *ff*

Euph. *mf* *ff*

49

50

Cor. *pp*

T. Hn. *pp sub.*

Bar. *pp*

Euph. *pp*

53

Cor. *ff*

T. Hn. *ff*

Bar. *ff*

Euph. *ff*

56

6

4

4

4 (octavo basso)

8<sup>va</sup>

Movement II:  
MOONLIT SONNET

Chorale (♩=72)

1 Stanza I

Cor. *p* *mp* *p*

T. Hn. *pp* *p* *mp* *pp* *p* *pp*

Bar. *pp* *p* *mp* *pp* *p* *pp*

Euph. *pp* *p* *mp* *pp* *p* *pp*

// Stanza II

7

// Stanza III

Cor. *mf* *p* *p*

T. Hn. *mp* *p* *p*

Bar. *mp* *p* *p*

Euph. *mp* *p* *p*

13

// Stanza IV

Cor. *mf* *p* *pp* *p* *pp*

T. Hn. *mf* *p* *pp* *p* *pp*

Bar. *mf* *p* *pp* *p* *pp*

Euph. *mf* *p* *pp* *p* *pp*

18 With Passion - a little more movement

Stanza V

Cup Mute

Cor. *p* *pp*

T. Hn. *p* *pp*

Bar. *mp*

Euph. *Solo - molto leg.* *mp* *mf*