TANIA CANDIANI **FIVE VARIATIONS OF PHONIC CIRCUMSTANCES AND A PAUSE**

ORGANO

by Tania Candiani

Organo allows us to explore the expressive sonorous qualities of language. It renders orality not by its meaning, but rather as pure sound.

This work merges an exploration of language, sound, magic and technology. It is a musical organ, built site specific for the Laboratorio Arte Alameda, programmed with software able to reproduce more than 1,200 phonic syllables from the Spanish language. Tone can be controlled with a pedal.

Through the use of a code that equals syllables to musical particles (notes, chords, intervals, etc.), text fragments can be turned into musical scores to be played in the keyboard. Texts are to be syllabically divided in a phonetic non-orthographic way, that is, in the way it is pronounced rather than written, for example in the word *exactamente* (exactly), division should turn into /ek-sak-ta-men-te/. Each syllable is called phoneme.

Some reductions and modifications has been made to express the phonemes, for instance, the sound of *c* in “ca”, “co”, “cu” and *q* in “que”, “qui” are expressed by phoneme /k/ in the code. Phoneme /b/ represents the sounds of *b* and *v*, since in Mexican pronunciation there is no difrerence between them. The entire list of reductions is shown below:

Vowels

/a/ = A
/e/ = E
/i/ = I, Y
/o/ = O
/u/ = U

Consonant

/p/ = P
/b/ = B, V
/t/ = T
/d/ = D
/k/ = Ca/Co/Cu, K, Qu
/g/ = Ga/Gue/Gui/Go/Gu/Gü
/f/ = F
/s/ = Z, Ce/Ci, S
/j/ = J, Ge/Gi
/ch/ = CH
/r/ = R
/rr/ = R(initial)/RR
/l/ = L
/ll/ = LL, Y

These reductions helped make programming easier, on top of having a closer relation to the way we pronounce. In this sense, words ***vi****no* (wine) and ***bi****lateral* (bilateral) would be pronounced both with phoneme /bi/: /**bi**-no/, /**bi**-la-te-ral/; words

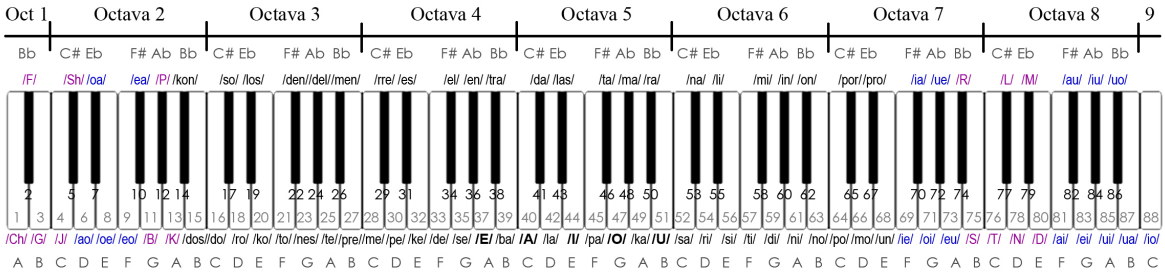
***ge**neral* (general) and *a**je**drez* (chess), with phoneme /je/: /**ge**-ne-ral/, /a-**je**-dres/, etc. (a complete example of phonemic syllabic division at the end).

The Code

Although arbitrary, the code follows certain logic of syllable distribution on the keyboard that makes it consistent and coherent.

Phonemes were divided according to their frequency in the language. More frequent phonemes (such as /de/, /a/, /ma/, etc.) where assigned to one key each to make it easier for the play it to perform them. Phonemes that are less frequent (such as /abs/, /llas/, /fris/, etc.) are to be produced by a combination of at least two keys, thus creating intervals or chords. In this sense, more frequent phonemes are easier to perform and read, whereas less frequent phonemes are more difficult to perform and read. For example, the phoneme /a/ is produced by playing key C (Do) from the fifth octave[1]; while /abs/ is produced by playing the Csus4 chord with the tonic on the fifth octave.

The following diagram shows the distribution of frequent phonemes on the keyboard.



Due to the fact that lower and upper octaves are more difficult to read from scores, not all the 88 keys on the keyboard were assigned with frequent phonemes. Instead, upper and lower octaves were assigned with single diphthongs and isolated consonant phonemes to be used when needed.

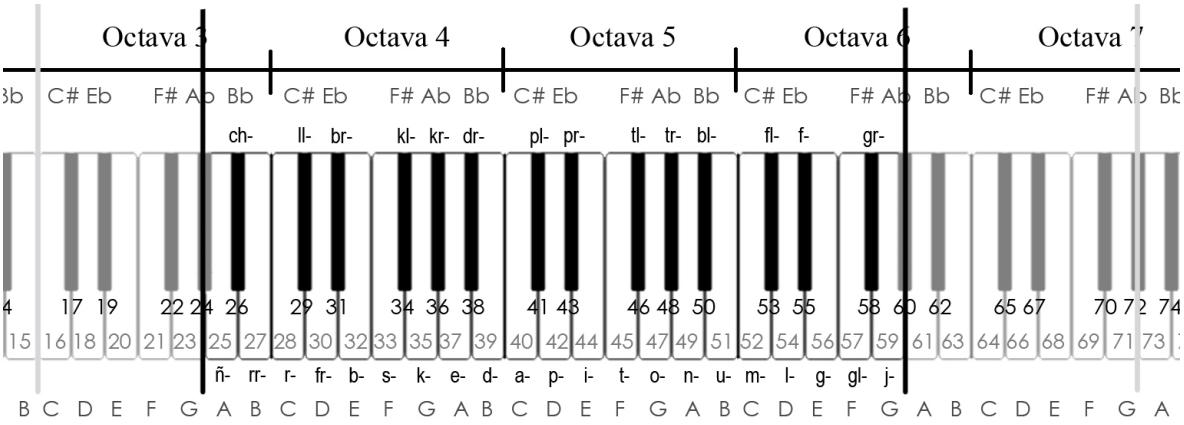
For the non-frequent phonemes, there are three aspects that determine the type of interval or chord which represents them: 1) the starting consonants or vowel, 2) the middle vowel(s), 3) and the ending consonant.

1) Starting consonants or vowel.

The letter or letters with which the syllable starts determine the tonic on which the interval or chord will be based. As will be described later, some chords could be

[1] Using Riemann index where C in 5th octave is middle C.

inverted, however, the tonic would remain according to the following diagram of starting letters.



If, for instance, a non-frequent phoneme starts with letters /pr-/ it will be represented with an interval or chord of Eb in fifth octave. We have decided to merge double-lettered starts to facilitate programming, that is, phonemes starting with /g/ have a different tonic from those starting with /gr-/. The diagram also shows, with two black lines, the range of tonics or root notes in the keyboard. The gray lines show the approximate extension of chords (taking into account long chords or inversions). A table of tonic keynotes is provided at the end.

2) The middle vowel.

Every syllabic phoneme should have at least a vowel on it, most of the times in the middle part of the syllable. The intermediate vowel of the phoneme determines the type of **interval** (if phoneme does not have an ending consonant), or if the **chord** is major or minor (when phoneme ends with consonant). The list of interval types is shown below.

Intervals

- If starting with consonant:

-a = 3M
-e = 3m
-i = 4
-o = 5
-u = 8

If the phoneme is, for instance /pri/, then, given it does not have an ending consonant, is an interval. One should look for the tonic keynote in the previous

diagram (Eb in fifth octave) and use the interval list to determine the type of interval, in this case /pri/ is an interval of 4 from Eb in fifth octave.

- If starting with vowel:

-d = 3m
-n = 3M
-b = 4
-l = 8
-s = 5
-p = 5+(#)
-m = 6
-r = 7(b)
-k = 7maj

If phoneme (with no ending consonant) starts with vowel, it follows the same logic of intervals. /ab/ phoneme would be an interval of 4 from C in 5th octave, whereas /ad/ would be an interval of 3m from the same tonic.

Chords

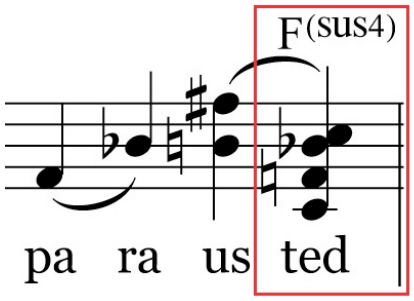
Chords represent syllabic phonemes that start with one or two consonants and also have an ending consonant. In these cases, the middle vowel determines if the chord is major or minor. When the intermediate vowel is /a/ or /e/, the chord is major, whereas if it is /i/, /o/ or /u/ the chord is minor. Phonemes with /a/ and /i/ remain as pure major or minor chords, whereas phonemes with /e/, /o/ are added with an extra fifth note in a lower octave to differentiate them from pure chords. Phonemes with /u/ are added with an extra third note in a lower octave for the same reason. For phonemes where the middle vowel is made up by a diphthong, we assigned inverted chords arbitrarily in a non-systematic way, we recommend to consult the entire code for this.

3) The ending consonant.

The ending consonant determines the type of chord that represents the phoneme. Due to the fact that many syllables in Spanish end with /-s/, these syllables remain as minor or major chords (depending on middle vowel). The rest of consonant endings follow the table below.

-d = sus2(if minor), sus4(if major).
-n = dim (if minor), aug (if major).
-m = 6
-l = add8
-r = 7dom
-k = 7maj
-p = add-9
-b = add9

Below is an example of a complex chord of a non-frequent phoneme alongside with frequent phonemes and an interval.



In this example, phoneme /ted/ starts with a /t-/ and thus should be a chord with F in 4th octave as its tonic. The phoneme has an /-e-/ as its middle vowel, since it is not /a/, an extra fifth note is added in a lower octave (C in 4th). Finally, it ends with consonant /-d/, hence making it a sus4 chord (Fsus4).

ANNEX

Example of syllabic phonemic division

Text: Si bien recuerdo, fuiste tú.

- Ortographic syllabic division: Si bien re-cuer-do, fuis-te tú.
- Phonemic division: /si/ /bien/ /re-kuer-do/ /fuis-te/ /tu/

Tonics table

Number	Phoneme	Tonic	Octave
1	/ñ-/	A	3
2	/ch-/	Bb	3
3	/rr-/	B	3
4	/r-/	C	4
5	/ll-/	C#	4
6	/fr-/	D	4
7	/br-/	Eb	4
8	/b-/	E	4
9	/s-/	F	4
10	/kl-/	F#	4
11	/k-/	G	4
12	/kr-/	Ab	4
13	/e-/	A	4
14	/dr-/	Bb	4
15	/d-/	B	4
16	/a-/	C	5
17	/pl-/	C#	5

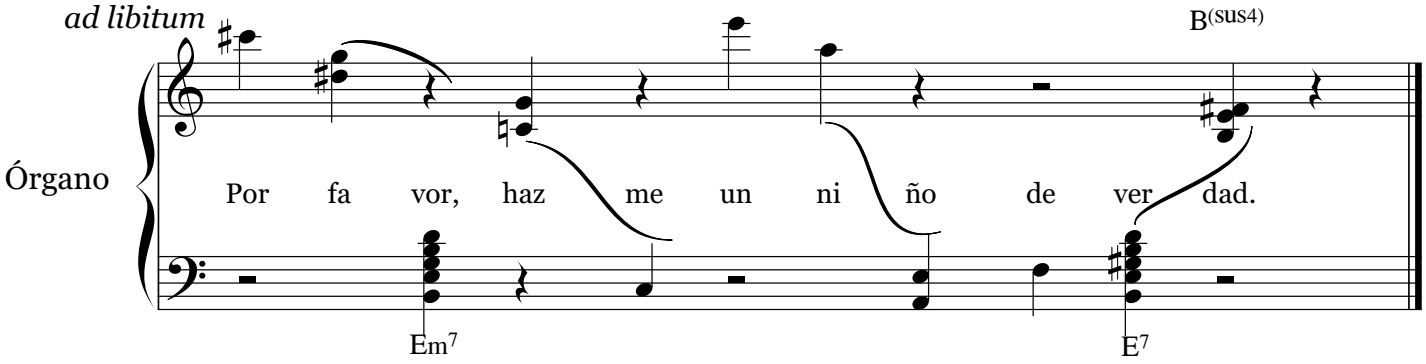
18	/p-/	D	5
19	/pr-/	Eb	5
20	/i-/	E	5
21	/t-/	F	5
22	/tl-/	F#	5
23	/o-/	G	5
24	/tr-/	Ab	5
25	/n-/	A	5
26	/bl-/	Bb	5
27	/u-/	B	5
28	/m-/	C	6
29	/fl-/	C#	6
30	/l-/	D	6
31	/f-/	Eb	6
32	/g-/	E	6
33	/gl-/	F	6
34	/gr-/	F#	6
35	/gl-/	G	6

Inteligencia Artificial*

Partitura para la obra *Órgano* de Tania Candiani

David en *Inteligencia Artificial*

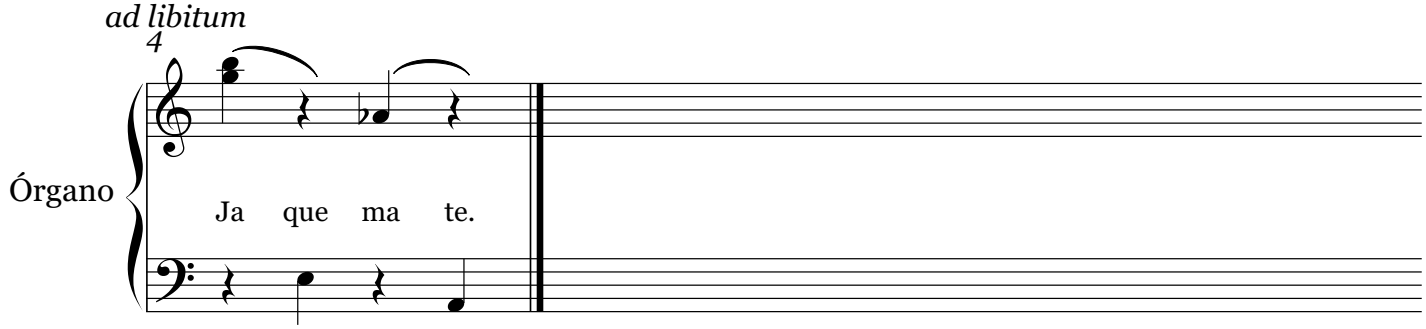
*fragmento



Jaque Mate

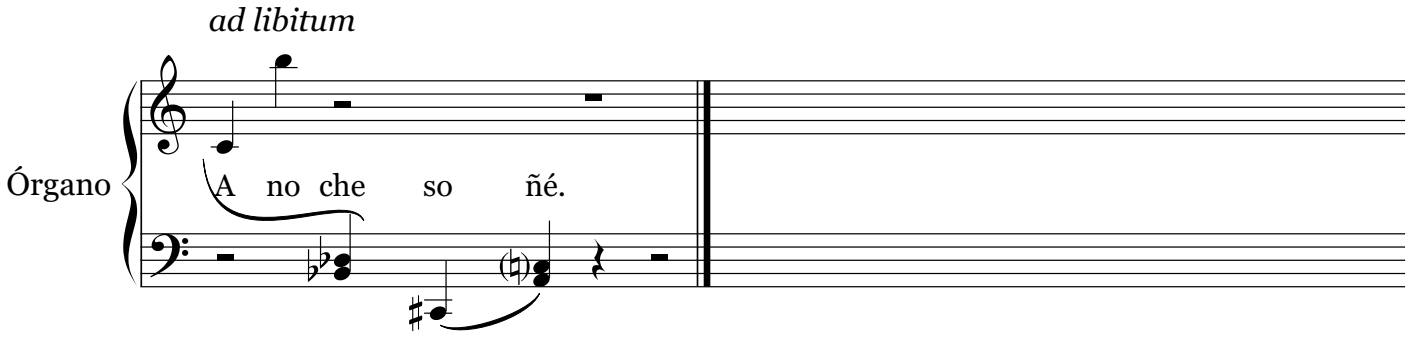
Partitura para la obra *Órgano* de Tania Candiani

Autor: Wolfgang von Kempelon (1734-1804)
Frase del turco jugador de ajedrez (Schachtürke)



Anoché soñé

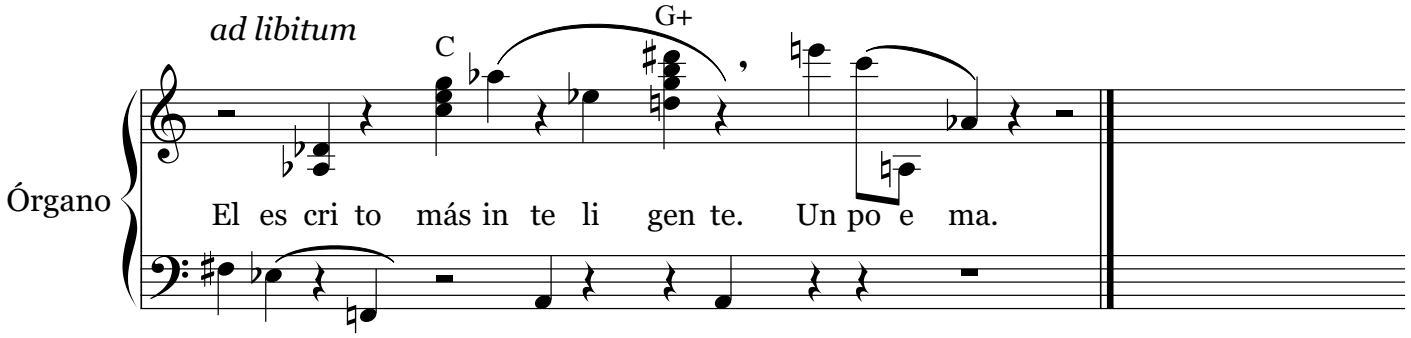
Partitura para la obra *Órgano* de Tania Candiani



transcrito en Sibelius 7

El escrito más inteligente. Un poema

Partitura para la obra *Órgano* de Tania Candiani

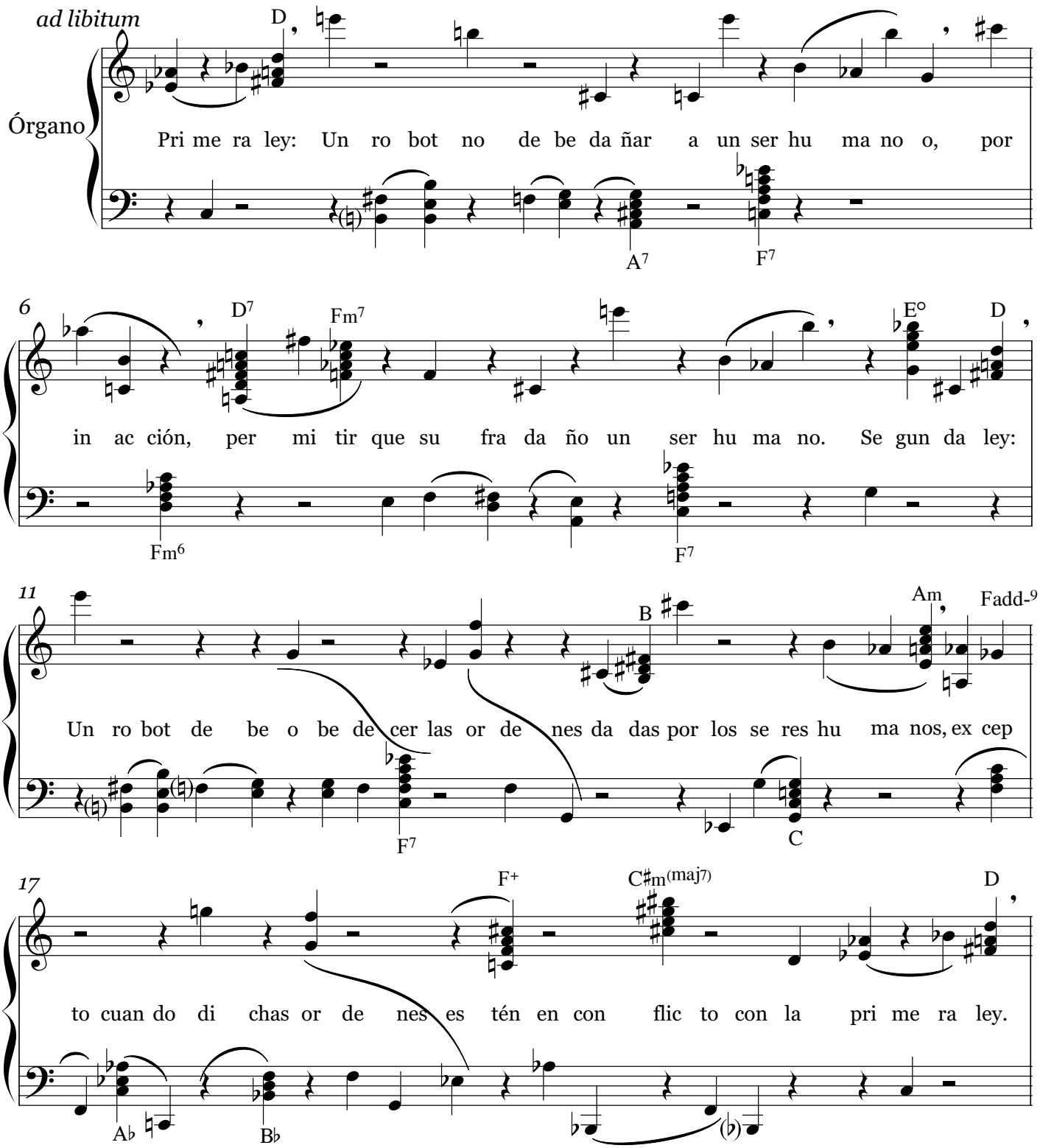


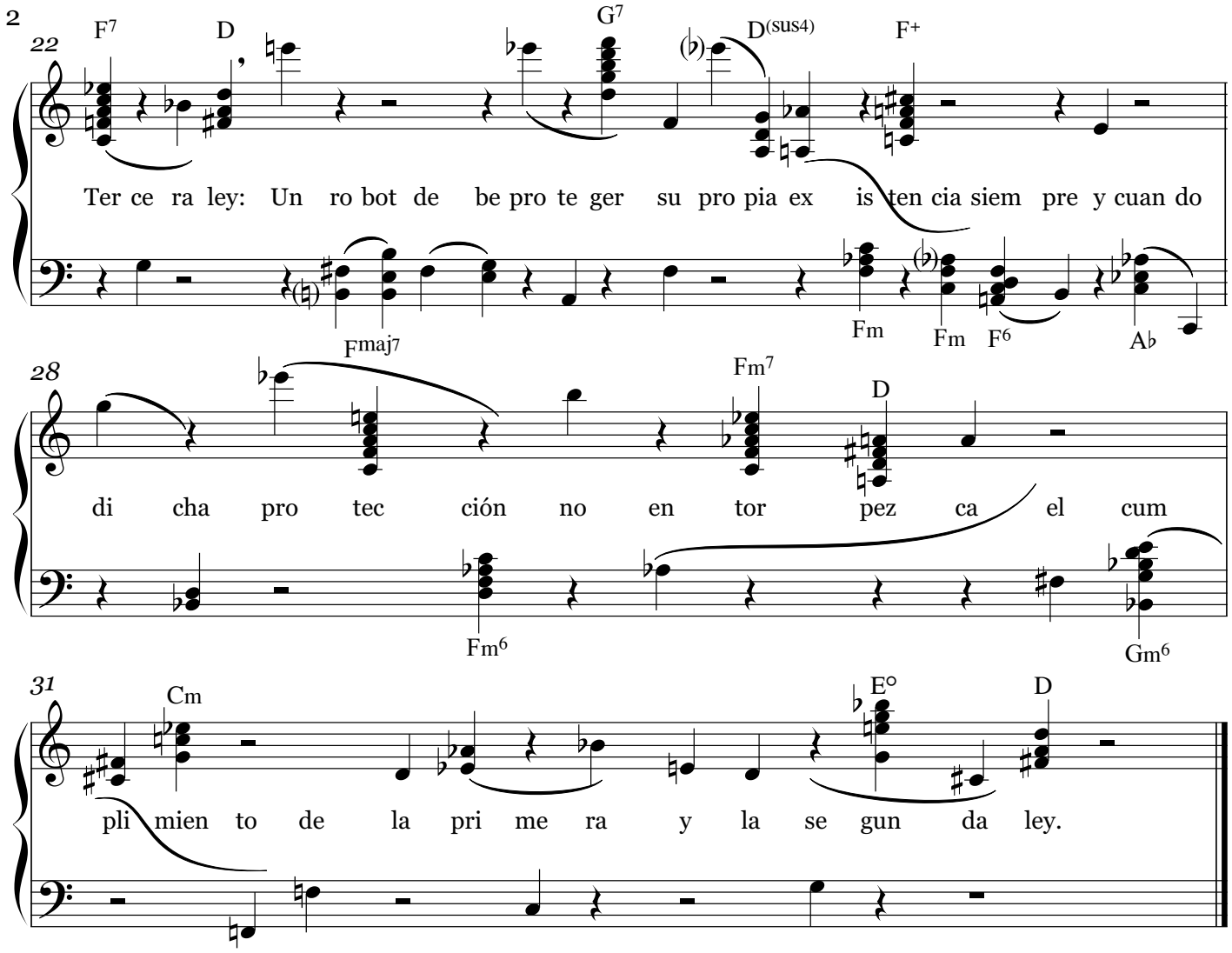
transcrito en Sibelius 7

Sueños de robot
(Leyes de la robótica)

Partitura para la obra *Órgano* de Tania Candiani

Autor: Isaac Asimov (1920-1992)

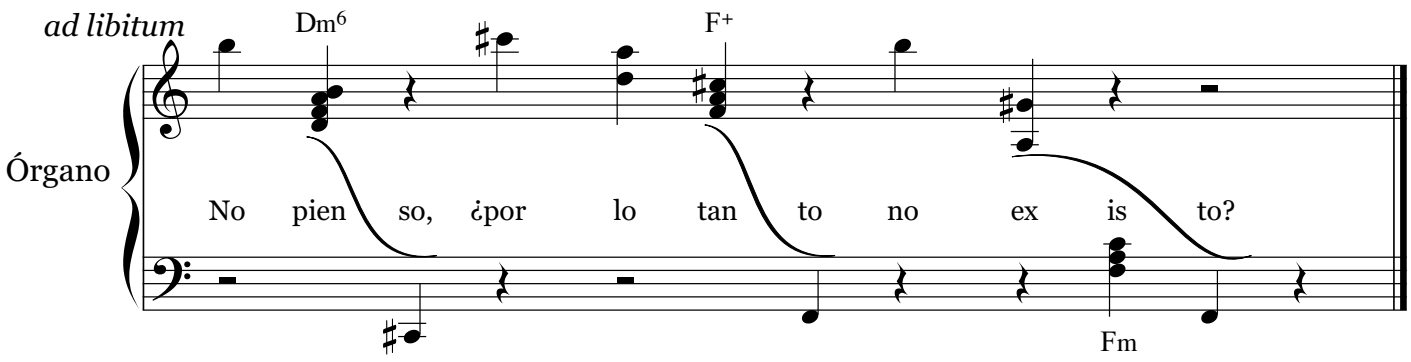



22
F7
D
G7
D(sus4)
F+
Ter ce ra ley: Un ro bot de be pro te ger su pro pia ex is ten cia siem pre y cuan do
Fmaj7
Fm
Fm
F6
A♭
28
Fm7
D
di cha pro tec ción no en tor pez ca el cum
Fm6
Gm6
31
Cm
E°
D
pli mien to de la pri me ra y la se gun da ley.

No pienso, ¿por lo tanto no existo?

Partitura para la obra *Órgano* de Tania Candiani

frase de autómata por
Pierre Jaquet-Droz (1721-1790)

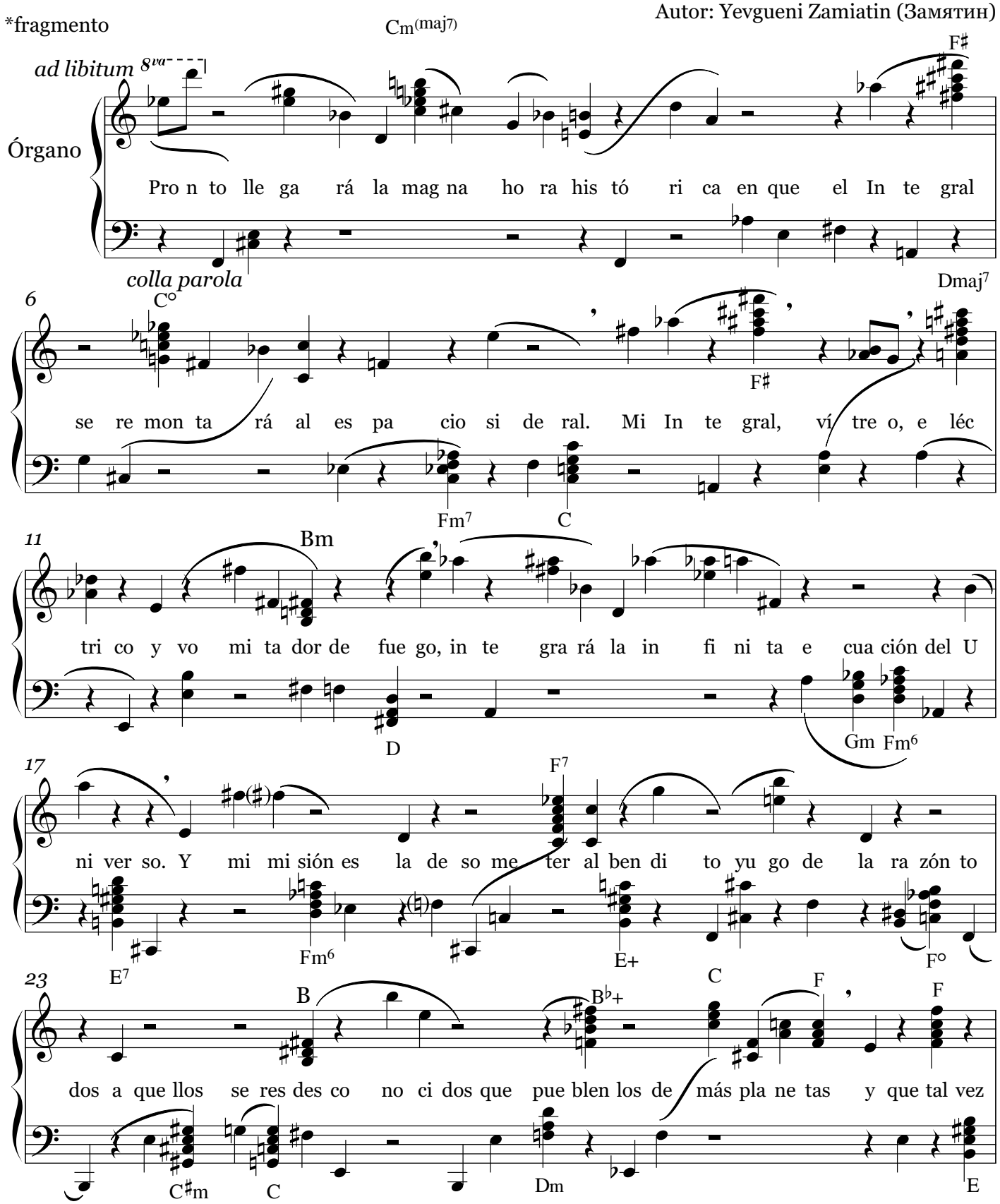


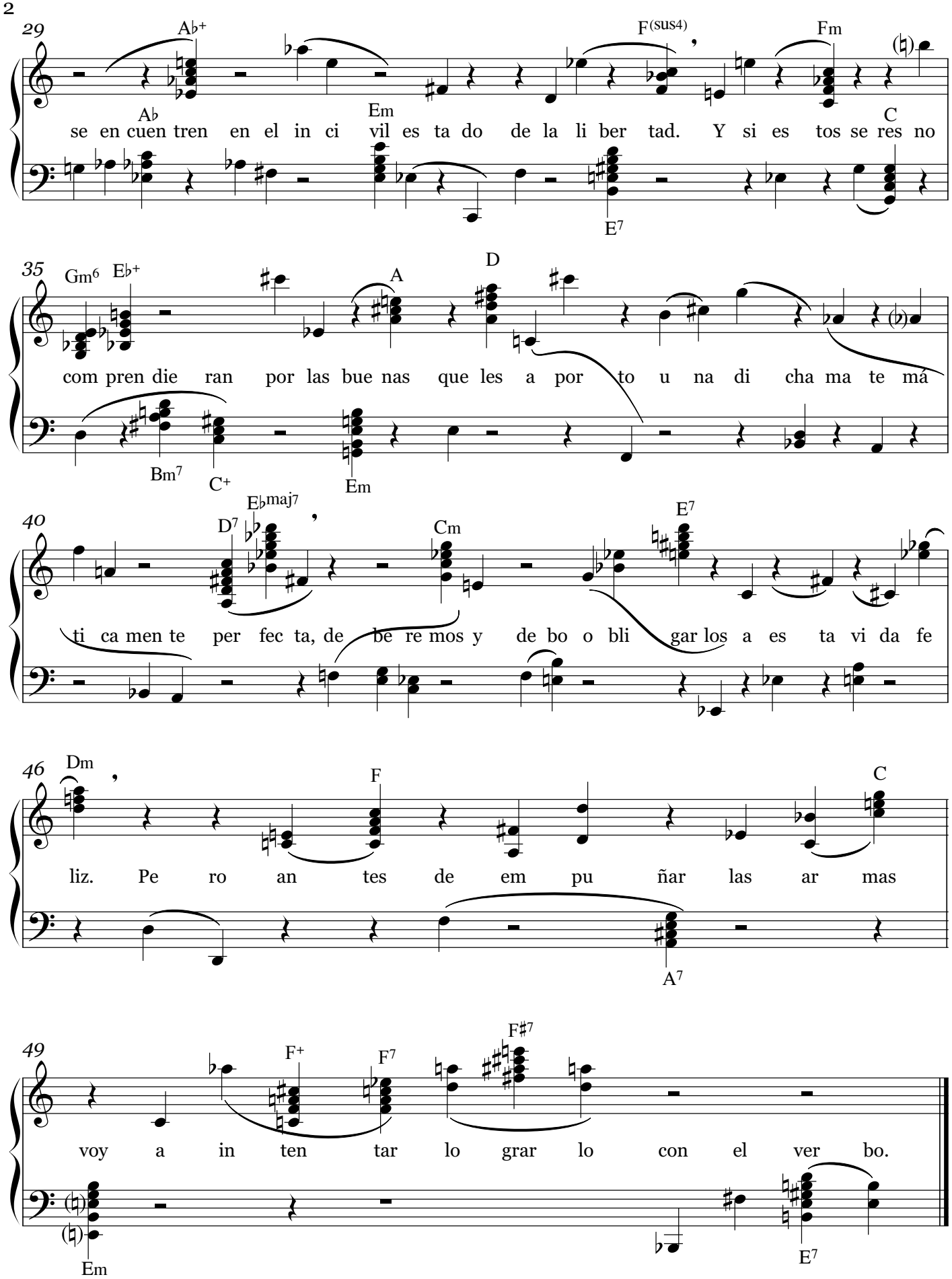
Nosotros*

Partitura para la obra *Órgano* de Tania Candiani

*fragmento

Autor: Yevgueni Zamiatin (Замятин)



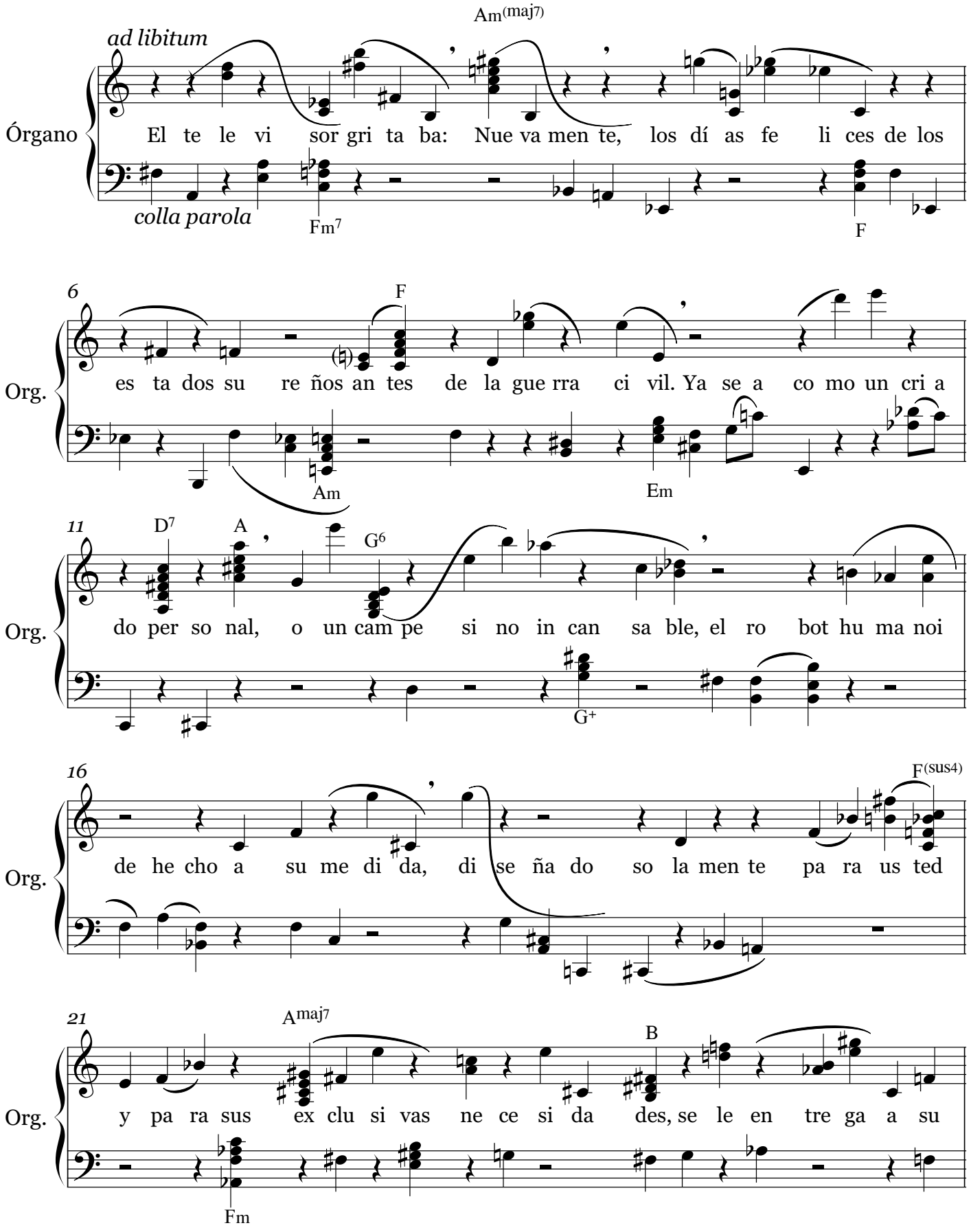

29
A♭+
F(sus4)
Fm
A♭
Em
C
se en cuen tren en el in ci vil es ta do de la li ber tad. Y si es tos se res no
E7
35
Gm6
E♭+
A
D
com pren die ran por las bue nas que les a por to u na di cha ma te má
Bm7
C+
Em
40
D7
E♭maj7
Cm
E7
ti ca men te per fec ta, de be re mos y de bo o bli gar los a es ta vi da fe
46
Dm
F
C
liz. Pe ro an tes de em pu ñar las ar mas
A7
49
F+
F7
F♯7
voy a in ten tar lo grar lo con el ver bo.
Em
E7

¿Sueñan los androides con ovejas eléctricas?*

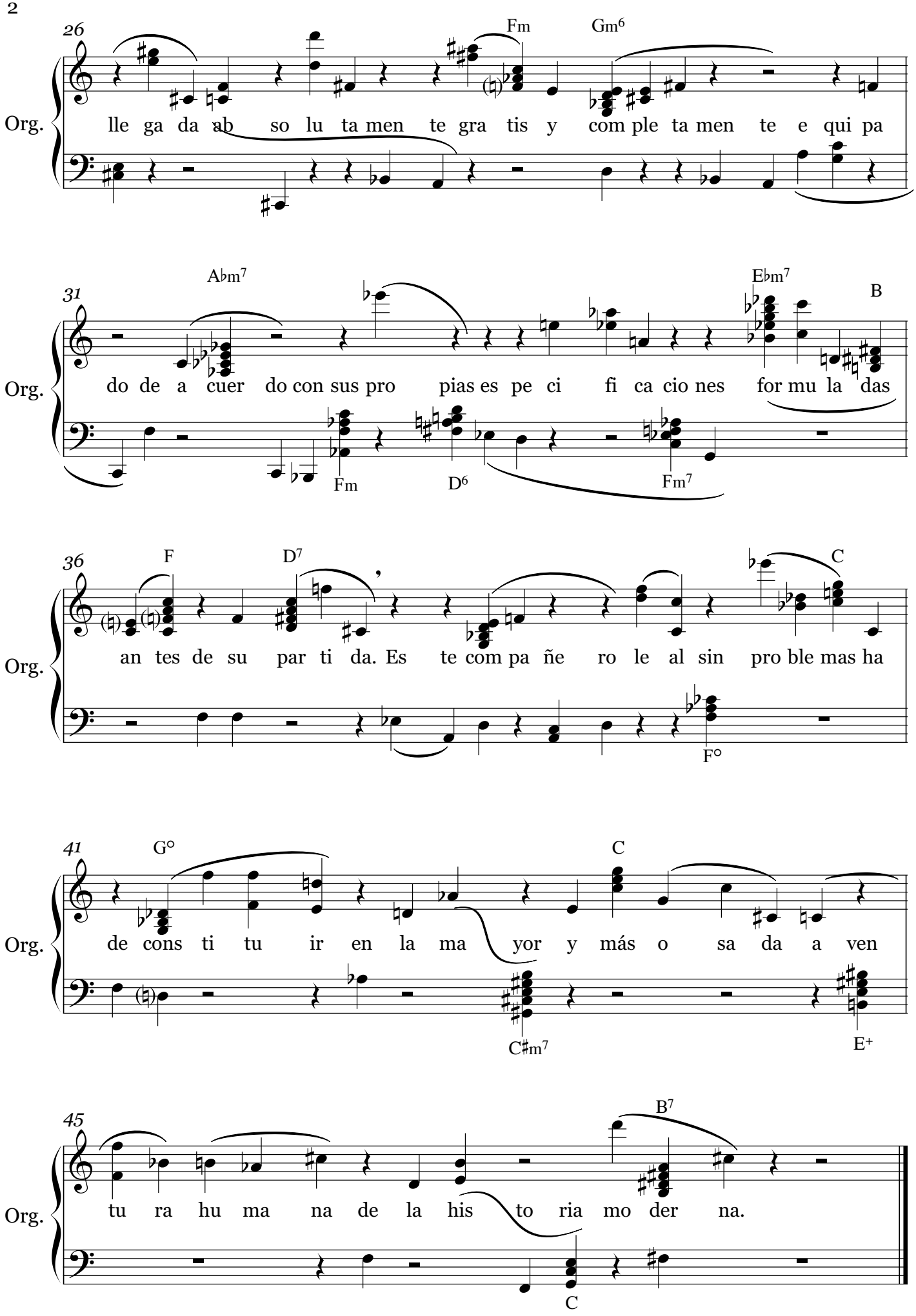
Partitura para la obra *Órgano* de Tania Candiani

*fragmento

Autor: Phillip K. Dick



transcrito en Sibelius 7


26
Fm
Gm6
Org.
lle ga da ab so lu ta men te gra tis y com ple ta men te e qui pa
31
Abm7
Ebm7
B
Org.
do de a cuer do con sus pro pias es pe ci fi ca cio nes for mu la das
Fm
D6
Fm7
36
F
D7
C
Org.
an tes de su par ti da. Es te com pa ñe ro le al sin pro ble mas ha
F°
41
G°
C
Org.
de cons ti tu ir en la ma yor y más o sa da a ven
C♯m7
E+
45
B7
Org.
tu ra hu ma na de la his to ria mo der na.
C