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The Routledge Companion to  
Popular Music Analysis:  
Expanding Approaches



Edited by Ciro Scotto, Kenneth Smith, and John Brackett

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# 11

## ELECTRONICALLY MODIFIED VOICES AS EXPRESSING THE (POST)HUMAN CONDITION IN DAFT PUNK'S *RANDOM ACCESS MEMORIES* (2013)

*Jane Piper Clendinning*

### Introduction

Electronically manipulated voices have been a part of avant-garde electronic music composition since Karlheinz Stockhausen's *Gesang der Jünglinge* (1955–56) and Luciano Berio's *Thema (Omaggio a Joyce)* (1958) and *Visage* (1961). In composing *Gesang der Jünglinge*, Stockhausen combined *elektronische Musik* techniques of the German electronic music studios (where music was created from electronically generated and processed sounds) with the French studio techniques of *musique concrète* (where sounds were recorded on tape, then processed) for the first time, resulting in a haunting musical landscape where recordings of the voice of a 12-year-old boy are interwoven with and merge into electronic sounds. Berio's compositions, which were prepared in the Studio di fonologia musicale in Milan, Italy, likewise depend on a blending of both types of techniques and are based on recordings of a human voice—that of Cathy Berberian, his wife at that time. These compositions provide a foundation for musical use of electronically manipulated voices in a wide variety of later works in both art music and popular genres.

The concept of making a human voice sound mechanical by employing electronic processing was not limited to avant-garde art music for long, as Wendy Carlos's synthesizer recordings, such as *Switched on Bach* (1968) and music for Stanley Kubrik's movie *A Clockwork Orange* (1971), bridged the gap between classical and popular, and brought electronically altered vocal sounds into the consciousness of a wider audience. Kraftwerk's title track from their influential album *Autobahn* (1974) brought electronically manipulated vocals (sung through a vocoder) and electronic music in general into the popular music realm.

Technological innovations beginning with commercially produced synthesizers in the 1960s and 1970s, and sequencers in the early 1980s have made it possible to process sounds electronically in a variety of ways. Vocoders, which were originally developed to allow voice data to be compressed for communication transmissions, began to be employed as

a means of processing vocal sounds for musical purposes. “Talk box” technology allowed instruments to sound like voices (or vice versa) by channelling amplified instrument sounds into the performer’s mouth, where they are shaped as spoken sounds are by the mouth and vocal folds, then are picked up by a microphone.<sup>1</sup> Auto-tune (originally intended to surreptitiously correct out-of-tune singing) emerged as a means to produce electronically altered vocals in Cher’s “Believe” (1998) and various songs by hip-hop artist T-Pain (beginning in 2005), providing a new method for creating striking vocal timbres.

Electronically modified vocals appear in recent popular music, including songs from Coldplay’s *Mylo Xyloto* (2011) and *Ghost Stories* (2014), and most notably in the music of Daft Punk’s Grammy Award winning album *Random Access Memories* (2013).<sup>2</sup> The primary method of electronic processing for voices in both the Coldplay and Daft Punk albums involves vocoders: audio processors that essentially split the vocal track into frequency bands, determine the amount of signal present in each band to isolate the spectral content, thereby reducing the amount of information needed to represent the original signal, then recreate the vocal track from that information, but with a loss of some of the original sound’s spectral and frequency detail because the data does not preserve the original waveform. Beginning in the 1960s, vocoders were able to pass through some of the high-pitched plosive and fricative elements of speech, to produce more intelligible utterances when the vocal sound was recreated, though the result is speech or singing that sounds mechanical—like a robot. One of Daft Punk’s collaborators for *Random Access Memories*, Giorgio Moroder (who is featured speaking in track 3), made extensive use of the vocoder on his albums *Einzelgänger* (1975) and *From Here to Eternity* (1977), and vocoder-processed voices have appeared since then on albums by many popular music artists. When electronic processing is applied to a singing voice, it is possible to make the voice sound unnatural, machine-like, fantastic, and frightening, but processing can also be employed to portray a wide variety of human emotions.

*Random Access Memories* provides a particularly interesting case study for consideration of vocal emotion, as many of the tracks employ both human and electronically manipulated voices and the emotions that I hear as portrayed by the voices differ widely. What about the voices in *Random Access Memories*? Do the voices in individual tracks convey emotion, and if so, what types of emotions do the voices convey? To unpack these questions, we will turn to research regarding human emotions from the field of social psychology, which supplies nuanced terminology for describing emotions that could possibly be conveyed by the voices and provides frameworks for considering linkage between types of closely related emotions. The second issue to be considered from research literature is how voices can convey human emotions. After exploring these issues, we will be equipped to examine the voices from *Random Access Memories* to consider what emotions they portray and how they might convey their emotional content. But first, it will be helpful to know a little about Daft Punk and their compositional process that resulted in *Random Access Memories*.

### Daft Punk

Daft Punk consists of co-creators Thomas Bangalter (1975–) and Guy-Manuel de Homem-Christo (1974–). They began composing and creating music as teenagers, forming Daft Punk in 1993, before either was 20 years old. Their choice of the title *Homework* (1997) for their first album created as Daft Punk was literal—the music was composed, performed, and its tracks created in Bangalter’s bedroom at his parents’ apartment. As Thomas Bangalter

describes in an interview from 2013, the equipment used for their first three albums was very similar to that available in electronic music studios one or two decades earlier:

The first almost eight years of our work was done in my bedroom, in my parents' flat. A very simple kit: a few drum machines, a few analog synthesizers, a small mixer, a small reverb unit, a compressor. We made a small experimental lab, with wires everywhere and a few pieces of electronic hardware. No multitrack system, no computer system initially, just a sequencer. We weren't working with digital audio, just reel-to-reel. That's how we created our own sound. *Discovery* relied on samples. On one sample would be a vocal part, on one sample would be a guitar part, and one sample would be the drums. So we've never actually made music with computers! [laughs] Neither *Homework* nor *Discovery* nor even *Human After All* were made with computers. They were made with hardware electronics and analog equipment that behave in weird ways, subjected to tuning changes with a change in room temperature.<sup>3</sup>

Their album *Discovery* (2001) included three successful singles "One More Time", "Digital Love", and "Harder, Better, Faster, Stronger". A vocoder-processed vocal sample from the latter was featured in Kanye West's track "Stronger" from his Grammy winning album *Graduation* (2007), and Daft Punk performed the song live with West on the 2008 Grammy broadcast. For their third album, *Human After All* (2005), their equipment was limited to "two drum machines and two guitars and one vocoder and one eight-track machine."<sup>4</sup>

After two years touring, Daft Punk's next project was a movie score to the film *Tron: Legacy* (2010, directed by Joseph Kosinski). The original *Tron* (1982) score was by Wendy Carlos, with some of the music created with analog and digital synthesizers and some performed by the London Philharmonic Orchestra. Daft Punk's score for *Tron: Legacy* featured similar forces.<sup>5</sup> As Guy-Manuel de Homem-Christo explained in an interview:

Synths are a very low level of artificial intelligence, whereas you have a Stradivarius that will live for a thousand years. We knew from the start that there was no way that we were going to do this film score with two synthesizers and a drum machine.<sup>6</sup>

Bangalter added:

This project is by far the most challenging and complex thing we have ever been involved with. Coming from our background of making electronic music in a small bedroom, then ending up having our music performed by a 90-piece orchestra—we are lucky to have had the opportunity to experience some powerful moments artistically over the years, but recording this orchestra was a very intense experience.<sup>7</sup>

In a later interview prior to the *Tron: Legacy* soundtrack release, Bangalter explains:

We were interested in the relationship between society and technology, and how the place of technology in the world had changed so much. The first movie in 1982 was a very colorful, hopeful, naive look at technology, and the power of the

computer. Thirty years later, this new movie would be a dark and not-innocent look at technology. It was in common with how we feel about technology, which is this love-hate relationship with it. It can be wonderful and terrifying.<sup>8</sup>

Their choice to dress as robot persona—in costume with their distinctive trademark helmets, long-sleeve jackets, long pants, and their hands covered by specially designed gloves—in all of their public appearances since the release of *Discovery* in 2001 ensures that their interest in the interactions between humans and technology, as well as their robotic voice effects, are not lost on their listeners. They refuse to have photos taken or distributed that show them without their masks, and they have remarkably managed to keep most information about their personal lives private, even in the current social media age.

In *Random Access Memories*, Daft Punk continue their musical exploration of what it means to be human in an increasingly mechanized and virtual world. Though they had begun work in 2008 on this their fourth album, prior to being asked to compose the score for *Tron: Legacy*, the film scoring experience dramatically changed their approach to the album when they returned to it in 2010. Unlike their first three albums, which were entirely created in their electronic music studio, Daft Punk recruited a long list of session musicians to perform live takes, which Bangalter and de Homem-Christo recorded and processed. They also hired an entire orchestra to perform on four tracks (3, 7, 9, and 10) plus a choir on one track (7), and limited the use of electronic instruments to a custom-built modular synthesizer,<sup>9</sup> vintage vocoders, and drum machines, which appear on only two tracks, as most of the drum and percussion parts were recorded live. The album features collaborations with Giorgio Moroder, Panda Bear (Noah Lennox), Julian Casablancas, Todd Edwards, DJ Falcon (Stéphane Quême), Chilly Gonzales (Jason Beck), Nile Rodgers, Paul Williams and Pharrell Williams, as well as vocoder-processed voices by Daft Punk. Bangalter explains their shift in approach:

Even in the '90s, there was an appeal in making music in bedrooms and moving toward a future that's now been reached. And so technology has become more invisible with this record, but there's still that science-fiction theme. There's a section that goes into the idea of a portrait of space travel and time travel. "Touch," with Paul Williams, for example, sounds really organic and acoustic, but it couldn't have been done 30 or 40 years ago because it has 250 tracks! (laughs) It totally relies on the most up-to-date processing power of computers to be able to handle and record and mix all these things together. We would have had to sync up ten 24-track tape machines to do this before, and that really wouldn't have been possible.<sup>10</sup>

The project was expensive, harkening back to the days when wealthy progressive (prog) rock musicians employed orchestras for their albums and for live concerts. Bangalter explains: "In the history of pop music, a lot of great records cost an enormous amount of money. There used to be a time where people that had means to experiment would do it, you know? That's what this record is about."<sup>11</sup>

What results from these collaborations is a type of 21st-century electronic music, using many of the techniques employed for avant-garde electronic music of the 1950s–1970s, including overdubbing, use of short clips, and synthesized and processed sounds. They also employ many electronic sound timbres that would be very familiar to listeners to early or

“classical” electronic music. The album also embraces historic timbres, recording, mixing, and processing techniques of 1970s–1980s popular music, as many of the studio musicians Daft Punk hired for the project had created the characteristic sounds of landmark popular music albums of the 1970s and 1980s, and their contributions were recorded using both analogue and digital technology, from which Bangalter and de Homem-Christo could select the exact timbral quality they wanted.<sup>12</sup> This album differs from products of the earlier electronic music studios in that it was created in collaboration with so many other musicians—and that they had access to both historical and current recording, mixing, and editing technology—but the process was similar in that Daft Punk recorded the live performance, then treated the live sounds as samples, putting them together with electronically created sounds to produce the tracks.

The preparation of the vocoder vocals involved time consuming, careful work in the studio. As Giorgio Moroder relates in an interview about working with Daft Punk on *Random Access Memories*: “They are perfectionists ... it would take me maybe twenty minutes, maybe an hour, to find an adequate vocoder sound ... They told me it took them a week or so only to find the sound, and who knows how many days to do the vocals. They are going into every little detail.”<sup>13</sup> Bangalter explains the reason for this extreme care in creating the voices in an interview with *Rolling Stone* magazine: “There’s this thing today where the recorded human voice is processed to try to feel robotic [referring to auto-tune] ... Here, we were trying to make robotic voices sound the most human they’ve ever sounded, in terms of expressivity and emotion.”<sup>14</sup> In order to consider the emotional expression of the voices of *Random Access Memories*, our next step is to borrow some tools for analyzing emotional expression from both social psychologists and robotics scientists.

### **Models for Analyzing Human Emotion**

There is an extensive body of research on human emotions in a variety of scholarly domains, including medicine, anthropology, acoustics, engineering, computer science, and cognitive, social, and environmental psychology. I consider here theories of human emotion advanced in the field of social psychology by Ekman, Mehrabian and Russell, Plutchik, and W. Gerrod Parrott.<sup>15</sup>

Paul Ekman proposed a list of six basic emotions in the early 1970s—Anger, Disgust, Fear, Happiness, Sadness, Surprise—based on his cross-cultural studies of non-verbal communication, which focused on facial expression of emotion.<sup>16</sup> He later added to his list other emotions than cannot be conveyed as clearly through facial expressions, including Amusement, Contempt, Contentment, Embarrassment, Excitement, Guilt, Pride in Achievement, Relief, Satisfaction, Sensory Pleasure, and Shame.<sup>17</sup> Though his work focused on facial expression and non-verbal communication—which are not directly relevant to recorded voices—his work is foundational in regard to the other models to be considered here.

The PAD (Pleasure, Arousal, Dominance) emotional state model, developed by Albert Mehrabian and James A. Russell, also in the 1970s, postulates that all emotions can be represented through three scales, measured on a continuum from Pleasure to Displeasure, Arousal to Nonarousal, and Dominance to Submission.<sup>18</sup> Combinations of different points on the three scales can represent a variety of emotional states. The terms Valence (positive vs. negative), Activation (ready-to-act or aroused vs. relaxed), and Power (dominant vs. submissive) are also used with this type of scalar model.



Though Mehrabian, Russell, and their contemporaries conceived these three characteristics as individual scales, beginning in the 1980s, some social scientists began to describe and categorize emotions employing three-dimensional designs. One famous illustration (shown in Figure 11.1) is Robert Plutchik's "wheel of emotions", represented as a rainbow-coloured "spinning top" that folds out into a flower with eight petals, each with a colour from the colour wheel. The petals are overlapped with concentric circles, with colours more intense and saturated toward the centre of the flower (the upper surface), and less saturated toward the edges (of the petals or the lower point of the top).<sup>19</sup> Plutchik called this model the "wheel of emotions" because it demonstrated how different emotions can blend into one another and create new ones. The inner circle of the wheel includes eight primary emotions, arranged in pairs of polar opposites: Joy/Sadness, Anger/Fear, Trust/Disgust, and Surprise/Anticipation. Each of these emotional pairs has an associated intensification represented on the inner circle, for example the Joy/Sadness pole can be intensified to Ecstasy/Grief. Each also has a less intense, more relaxed and calm variant represented on the outer circle, for example the Joy/Sadness pole can diminish in intensity to Serenity/Pensiveness. With eight emotional states identified between the petals (Love, Optimism, Aggressiveness, Contempt, Remorse, Disapproval, Awe, and Submission), this image reflects the relationships between a total of 32 emotions.

More recent scholarship has expanded the number of emotions, which has necessitated different visual models. For example, in 2001, Parrott began with six basic emotional categories—Love, Joy, Surprise, Anger, Sadness, and Fear—then identified over one hundred emotions related to those six and conceptualized them as a branching tree-structure,

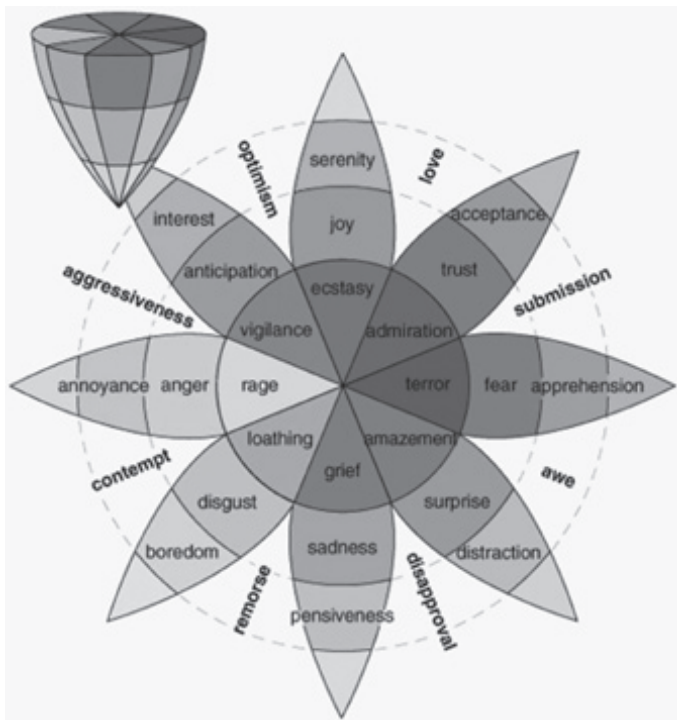


Figure 11.1 Plutchik's Wheel of Emotions (Rendered in Black and White)

though they are also sometimes represented more compactly as a three-columned list (as shown in Table 11.1).<sup>20</sup> The astute reader will have noticed by now that these models do not concur on the list of primary emotions or how to categorise emotions, but they have provided more than enough terminology for consideration of emotional characteristics of voices in *Random Access Memories*.

Table 11.1 Parrott's Tree-Structured List

<i>Primary Emotion</i>	<i>Secondary Emotion</i>	<i>Tertiary Emotion</i>
Love	Affection	Adoration, affection, love, fondness, liking, attraction, caring, tenderness, compassion, sentimentality
	Lust	Arousal, desire, lust, passion, infatuation
	Longing	Longing
Joy	Cheerfulness	Amusement, bliss, cheerfulness, gaiety, glee, jolliness, joviality, joy, delight, enjoyment, gladness, happiness, jubilation, elation, satisfaction, ecstasy, euphoria
	Zest	Enthusiasm, zeal, zest, excitement, thrill, exhilaration
	Contentment	Contentment, pleasure
	Pride	Pride, triumph
	Optimism	Eagerness, hope, optimism
	Enthrallment	Enthrallment, rapture
	Relief	Relief
Surprise	Surprise	Amazement, surprise, astonishment
Anger	Irritation	Aggravation, irritation, agitation, annoyance, grouchiness, grumpiness
	Exasperation	Exasperation, frustration
	Rage	Anger, rage, outrage, fury, wrath, hostility, ferocity, bitterness, hate, loathing, scorn, spite, vengefulness, dislike, resentment
	Disgust	Disgust, revulsion, contempt
	Envy	Envy, jealousy
	Torment	Torment
Sadness	Suffering	Agony, suffering, hurt, anguish
	Sadness	Depression, despair, hopelessness, gloom, glumness, sadness, unhappiness, grief, sorrow, woe, misery, melancholy
	Disappointment	Dismay, disappointment, displeasure
	Shame	Guilt, shame, regret, remorse
	Neglect	Alienation, isolation, neglect, loneliness, rejection, homesickness, defeat, dejection, insecurity, embarrassment, humiliation, insult
Fear	Sympathy	Pity, sympathy
	Horror	Alarm, shock, fear, fright, horror, terror, panic, hysteria, mortification
	Nervousness	Anxiety, nervousness, tenseness, uneasiness, apprehension, worry, distress, dread



The application of these emotional categories will be systematic, but, by necessity, will be somewhat subjective. I hope that other analysts will be able to replicate the procedure I have developed here—not only for the tracks of this album, but other vocal works as well. Please note that I am applying these models to identify what emotion the voice represents in each track and across the album, with consideration also of the text and the musical setting, but this approach does not directly address any emotional response on the part of the listener.<sup>21</sup>

### Models for Analysing Vocal Expression or Vocal Emotion

An interesting approach for study of vocal expression or vocal emotion comes from research designed to create expressive robots. MIT (Massachusetts Institute for Technology) Artificial Intelligence Laboratory Humanoid Robotics Group researchers have been working on creating an expressive anthropomorphic robot called Kismet that engages people in natural and expressive face-to-face interaction.<sup>22</sup> They have found that the creation of vocal emotion in face-to-face situations involves facial expressions (including the position of lips), body postures (in the case of Kismet, including the position of ears, eyebrows, the visual gaze, and the orientation of the head), and characteristics of the voice. Because we will be considering voices in recorded music, facial expressions and body postures are elements that are not in play in the music of Daft Punk.<sup>23</sup>

Table 11.2 shows characteristics of the voice in different types of emotional expressions that the MIT Humanoid Robotics Group researchers are applying in making Kismet expressive. The MIT group's findings on aspects of the voice contributing to emotional expression—speech rate, pitch average, pitch range, intensity or loudness, voice quality, pitch changes, and articulation—are relevant to consideration of voices in *Random Access Memories*. Instead of facial expressions and body postures, we can consider the musical setting—the other instruments beside the voices—and we also have the words and semantic meaning to consider when evaluating the emotional expression of the voices.

Table 11.2 The effect of emotions on the human voice

	<i>Fear</i>	<i>Anger</i>	<i>Sorrow</i>	<i>Joy</i>	<i>Disgust</i>	<i>Surprise</i>
<b>Speech Rate</b>	much faster	slightly faster	slightly slower	faster or slower	very much slower	much faster
<b>Pitch Average</b>	very much higher	very much higher	slightly lower	much higher	very much lower	much higher
<b>Pitch Range</b>	much wider	much wider	slightly narrower	much wider	slightly wider	
<b>Intensity</b>	normal	higher	lower	higher	lower	higher
<b>Voice Quality</b>	irregular voicing	breathy chest tone	resonant	breathy blaring	grumbled chest tone	
<b>Pitch Changes</b>	normal	abrupt on stressed syllable	downward inflections	smooth upward inflections	wide downward terminal inflections	rising contour
<b>Articulation</b>	precise	tense	slurring	normal	normal	

### **Analysis of *Random Access Memories***

The album's title—*Random Access Memories*—captures Daft Punk's interest in memories of the past, referencing both random-access memory technology and the human experience. Bangalter states: "We were drawing a parallel between the brain and the hard drive—the random way that memories are stored."<sup>24</sup> Though Daft Punk do not reference the term "concept album" in interviews about their work, *Random Access Memories* is a concept album, in the same vein as three 1970s rock albums cited by Daft Punk as influences: The Eagles, "Hotel California." Fleetwood Mac, "Rumors," and Pink Floyd, "Dark Side of the Moon."<sup>25</sup> The songs of each of these albums unite around a central theme, though they are not intended to express a specific teleological narrative. One of Daft Punk's collaborators, Todd Edwards, cites Bangalter as explaining that "the most important records in music, whether it's *Led Zeppelin* [...] or *The White Album* or *Sgt. Pepper's...* or *Quadrophenia* or *Tommy*, are the ones that take you on a journey for miles and miles."<sup>26</sup> Like the albums cited, this album's contents reflect a journey through the memories of the unnamed individual whose thoughts form the album's experiences. The tracks will be considered in order to examine the emotional content of moments presented by individual songs, as well as the trajectory of the whole.

#### ***Track 1: "Give Life Back to Music" (writing credits to Bangalter, de Homem-Christo, Paul Jackson, Jr., and Nile Rodgers)***

This opening track features guitarists Nile Rodgers and Paul Jackson, Jr., drums by John J. R. Robinson, and vocoder vocals by Daft Punk, with supporting instrumentation including pedal steel, keyboards, and bass. Ascending electronic "swoops" as well as other effects typical of dance club tracks were created by Daft Punk using their modular synthesizer. The overall emotional content of the heavily processed vocals in this upbeat dance track seem consistent throughout and can be described as "happiness" or "joy," with their PAD descriptor strongly to the side of the scales of Pleasure/Aroused/Dominant. On Plutchik's wheel, the vocals seem to fall into the Joy/Ecstasy category, whereas in Parrott's tree-structured list, Joy-Contentment-Pleasure and Joy-Optimism-Eagerness apply. Regarding the MIT categorizations, the vocal range is moderate to high, vocal intensity is high, the timbre of the voices could be described as edging toward "blaring" in tone quality (though properly balanced in volume in the context of the song), and the sung word rate is fast, matching the tempo. All of these characteristics correspond to "joy" on the MIT chart, for a unified presentation of emotion throughout the song.

#### ***Track 2: "The Game of Love" (writing credits to Bangalter and de Homem-Christo)***

The vocoder-processed voice in this track is very distorted sounding—open, hooded, sensitive, nasal, but with clearly articulated words. The accompaniment consists of prominent cymbal, guitar, pedal steel, keyboards, synthesizers, bass, and drums.

Examining the song using the MIT categories, this track is slightly slower, and there is a lower level of intensity than the first track. Though in the same key as the first track, the voice begins the melody lower, and is more relaxed and resonant, with downward inflection and slurring of some words, reflecting "sorrow". Considering the voice on the PAD scales, it strongly reflects Non-Arousal/Displeasure/Submissiveness. On Plutchik's

wheel, sadness is the overall emotional effect, but Parrott's list provides options for a more nuanced reading of Sadness–Disappointment–Dismay and Sadness–Despair and Melancholy, as well as Sadness–Suffering–Hurt. To my ear, the vocal emotion does not remain consistent throughout this track as it did in the first one, as the pitch drop to a lower octave on the repetition of “When you decided to walk away” reaches an emotional low point, while the vocal treatment of the lyric “and it was you” conveys Love–Affection–Tenderness (and possibly some of the other emotions in that tertiary category as well). The vocal rendering of the lyric “Me I just wanted you to stay” changes quality as well, perhaps reflecting Love–Longing.

***Track 3: “Giorgio by Moroder” (writing credits to Bangalter, de Homem-Christo, and Moroder)***

The only vocals on this track are words spoken by Giorgio Moroder, which tell the story of how he became a composer who wrote “music of the future” employing modular synthesizers. While there are no sung vocals to be analyzed here, the emotions conveyed by the instrumental parts (including full orchestra) seem to be representative of the top three petals of Plurchik's wheel—those including Interest, Optimism, Joy, Serenity, Love, and Acceptance.

***Track 4: “Within” (writing credits to Bangalter, Jason “Chilly Gonzales” Beck, de Homem-Christo)***

My personal favourite, this track made me first begin thinking about the types of emotional content presented by the voices of *Random Access Memories*. The plaintive robotic voice seemed so poignant, within its setting of pure (non-electronically altered) piano accompaniment, with bass, drums, percussion, and sizzle cymbal. The voice is very distorted and the pitch is a little flat (intentionally so) at the beginning compared to the accompaniment, but the words are clear and haunting. I hear this song reflecting at least two distinct feelings—one associated with the verse text “There are so many things I don't understand” and another with the chorus text “I've been for sometime, looking for someone” set to a melodic sequence in the vocal part. The voice in the verse is deep, resonant, and nasal, has downward inflections, begins with a narrow and lower pitch range, sings a repetitive melodic line, and the tempo is slower—all consistent with the MIT chart's emotion “sorrow.” For the PAD scale, Displeasure/Nonarousal/ Submission seems to fit. Since the emotional content here is complex, the Parrott categories yield the most useful descriptors: in the Fear–Nervousness category most of the tertiary emotions apply, including Anxiety, Uneasiness, Apprehension, Worry, Distress, and Dread, but there is also Sadness–Neglect and many of that category's tertiary emotions, including Alienation, Isolation, Neglect, Loneliness, Rejection, Homesickness, Dejection, Insecurity, and Humiliation. In the second half of the song, a second, higher-pitched vocoder-processed voice responds to statements in the verse.

In the chorus, the vocal range shifts an octave higher and the sound seems more open, with a higher energy and upward inflection, corresponding to the MIT category “joy”. For this part of the song, the Parrott categories Joy–Optimism–Hope and Love–Longing seem to apply, though the emotional concerns of the verse have not been resolved.

**Track 5: “Instant Crush” (writing credits to Bangalter, Julian Casablancas, de Homem-Christo)**

This dance track features standard section types, as shown in the chart below, but they appear in an unusual order, with the bridge between verse 2 and a guitar solo (by Casablancas on the verse music) instead of preceding the return of the pre-chorus and chorus, and there are two different post-chorus sections. The accompaniment includes lead guitar, synthesizers, keyboards, bass, percussion, and drums.

<i>Section</i>	<i>Bars (counted in 4/4)</i>	<i>Approximate Section Timing (rounded to the second)</i>
Intro	12 (8 + 4)	0:00–0:26
Verse 1	24 (8 + 8 + 8)	0:27–1:17
Pre-chorus	4	1:18–1:27
Chorus	16 (8 [4+4] + 8 [4+4])	1:28–2:01
Post-chorus 1	4	2:02–2:10
Verse 2	16 (8 + 8)	2:11–2:45
Bridge	8 (4 + 4)	2:46–3:03
Guitar solo (Casablancas)	8	3:04–3:20
Pre-chorus	4	3:21–3:29
Chorus	16 (8 [4+4] + 8 [4+4])	3:30–4:04
Post-chorus 2	8 (4+4)	4:05–4:20
Chorus	16 (8 [4+4] + 8 [4+4])	4:21–4:57
Outro (Silence)	16 (4 + 4 + 4 + 4)	4:58–5:32 5:32–5:37

Though the voice overall does not sound overtly processed, listening carefully I hear a slight metallic characteristic in the initial verse section, and there seems to be a faint lower line (perhaps synthesizer or keyboards) doubling the prominent higher-pitched vocal. A comparison with other songs by Julian Casablancas reveals that there *was* a high level of processing applied—his normal singing voice is quite low and rich, around the pitch level of the faint lower line (approximately an octave below the high-pitched vocal), to the point that this vocal does not sound like Casablancas at all. De Homem-Christo noted, “It is true that it is not his usual register, it is the way Julian reacted to the track so for us it is even more exciting”.<sup>27</sup> The voice quality in the pre-chorus and chorus sound more strongly processed, and the voice is combined with keyboards in the chorus. In verse 2, the voice is overdubbed in (at least) three distinguishable parts, with a second part providing counterpoint, and a lower-pitched voice that pronounces all of the words, but stays on a consistent drone pitch through each line of text. Vocals are layered in the bridge, pre-chorus, and post-chorus 2 as well.

Regarding the MIT categories, the voice here seems breathy, has smooth upward inflections, and normal articulation, but the words not as clear as might be usual because of the vocoder processing. On the PAD scale, I am reading the voice as Pleasure/Aroused/ and in the middle on Dominant-Submissive. For Plutchik’s wheel, Joy, Optimism, Anticipation, and Interest seem to apply. Using the Parrott list, Joy-Zest-Enthusiasm and

Joy-Optimism-Hope reflect the vocal emotions in this song. Interestingly, it is not clear how any of these impressions of the emotional content from the vocal quality fit with the lyrics that do not seem to be expressing pleasure, joy, or optimism, though their exact meaning is not clear.

***Track 6: “Lose Yourself to Dance” (writing credits to Bangalter, de Homem-Christo, Nile Rodgers, and Pharrell Williams)***

This track features vocals by Pharrell Williams and Nile Rogers on guitar, accompanied by bass, drums, and hand claps. The form is verse-chorus, with the verse-chorus pair repeated three times, each time with different layers than before. Williams’ voice, which has flexible and engaging timbral characteristics without electronic manipulation, sounds unaltered or minimally processed at the beginning of each verse, then is overdubbed at the very end of the verse. During the second appearance of the chorus, a strongly processed vocoder voice sings a melodic wedge pattern that starts low in pitch, then alternates the first pitch (“Come”) with others (“on”) that ascend a scale, as if urging on both Williams and the dancers. The chorus is repeated with a second vocoder adding “everybody’s dancing on the floor,” followed by more layers of vocoder-processed vocals that build intensity without changing the tempo or Williams’ vocal.

The emotional quality of the lead vocal is consistent throughout the song. The tempo is somewhat slower than the usual dance beat, with the vocal pitch much higher and spanning a wide vocal range, and a breathy vocal quality that is upward inflected, classifying as “joy” using the MIT categories. On the PAD scale, Pleasure/Arousal/Dominant, and on Plutchik, Ecstasy and Joy apply. Parrott’s table, as usual, provides more nuanced descriptions of Joy-Zest-Enthusiasm, Excitement, Thrill, Exhilaration, Cheerfulness, and Happiness.

***Track 7: “Touch” (featuring Paul Williams) (writing credits to Bangalter, Christopher Paul Caswell, de Homem-Christo, and Paul Williams Jr.)***

Clocking in at 8’18” this is a long, very complicated track that changes emotional content frequently and dramatically, and features full instrumentation: guitar, lap steel, keyboards, modular synthesizer, *ondes martinot*, bass, drums, twelve-voice choir and a full orchestra. The track also has numerous electronic-music sounds reminiscent of 1960s and 70s “classical” electronic music compositions. Daft Punk noted that the song is the most complex piece on the record, being composed of over 250 components.<sup>28</sup> “Touch” features lyrics written and performed by Paul Williams, who is best known for his work with Jim Henson’s Muppets and his song “Rainbow Connection”.

The track begins with 45 seconds of white noise and sparking electronic sounds as an introduction, then a heavily altered low-pitched speaking voice enters, saying “Touch, touch, I remember touch,” beginning the first large section of this track. The entrance of the voice is startling as it sounds quite aggressive; its sound quality corresponds to “anger” or perhaps “disgust” on the MIT chart, as it is a low-pitched, slower, moderate intensity chest tone that seems tense. This voice continues speaking, occasionally almost shifting into a singing tone without succeeding in doing so. On the PAD scale, I read the emotion expressed by this voice as Displeasure/Aroused/Dominance, and on Plutchik’s wheel, Anger, Annoyance, Contempt, and Disgust. From the Parrott table, under secondary emotions Sadness and Neglect, the terms Disgust, Contempt, Exasperation, Frustration, Grumpiness, Bitterness,

and Resentment all seem to apply to this voice. The section ends with building tension and the pitch moving higher in the accompanying electronics, then suddenly the mood changes at 1'50", the start of section 2.

Section 2 begins with a sudden entrance of an unaltered, very expressive singing voice—clearly the same voice as before, but expressing a strikingly different mood—singing the same words with which the speaking voice began: “Touch, I remember touch.” This voice is accompanied by simple, quiet piano chords; it expresses Sadness and Displeasure still, but with much lower level of Arousal, and it sounds less Dominant and more Submissive on the PAD scale. Because of the drop of intensity, Pensiveness would be an appropriate descriptor on the Plutchik wheel, and using Parrott’s table, Neglect, Alienation, Isolation, Loneliness, and Dejection apply.

The third section begins with another change of mood on the words “Kiss, suddenly alive” at 2'31”. The singing voice is higher and sounds happier, and the accompaniment suddenly is upbeat and energetic. This memory is apparently a happy one. On Plutchik’s wheel the emotion has shifted to Joy, Love, Trust, and using Parrott’s table, Love-Attraction-Longing and Joy-Celebration-Gaiety are apt descriptors. This section ends with the text “I need something more” that was first expressed by the aggressive speaking voice in Section 1, but this singing voice is optimistic that he will get it, shifting the mood slightly to include Parrott’s Joy-Optimism-Hope category. An instrumental break follows (beginning at 2'56”), continuing the optimistic mood—at first calmly and reflectively, then the drums kick in at 3'21”, followed by a Dixieland jazz band, for a truly upbeat, celebratory feeling until 4'12”. This must have been a very richly happy memory.

Section 4 begins with another build, siren swoop, and an abrupt slowing of the tempo to roughly half the bpm of the previous Dixieland passage. At 4'28”, a vocoder vocal ensemble enters, singing “If love is the answer, you’re home, hold on”; these vocoded voices are soon joined by an actual choir. This track has the first (and only) appearance of female voices in the album. The emotional content here reflects Pleasure/Arousal/Dominance on the PAD scale, the top three pedals Anticipation/Interest—Optimism—Joy/Serenity—Love—Trust/Acceptance on Plutchik’s wheel, and Love—Affection, Tenderness, Adoration on Parrott’s table. These readings correspond to “joy” on the MIT chart, with a much slower tempo, much higher pitches (with the female voices), a wider pitch range, higher intensity (but not a “negative” type of intensity), upward inflection, and breathy vocals. This section ends with an ascending electronic siren swoop, and another sudden change of mood at 5'30”.

The final section of this track begins with instrumentals: the return of 1960s electronic sounds, followed by a synth keyboard reminiscent of Wendy Carlos’s *Switched on Bach*. A tambourine, drums, and the orchestra enter at 6'15”, with yet another shift in mood, tempo, and timbre, as strings soar out of the texture. The choral vocals enter almost imperceptibly at 6'30”, and rise in the mix to prominence by 7'00”. Intensity builds, first with descending electronic swoops, then as many other electronic sounds enter. Everything stops abruptly at 7'42”, with two full seconds of silence.

The silence is broken with Paul Williams’ voice—breathy, unaccompanied and unaltered—singing “Touch, sweet touch.” As his voice gains strength, a piano enters, as in Section 2, playing a simple choral accompaniment. His voice reaches an emotional climax on the words “You’ve almost convinced me I’m real”, then dies away on “I need something more”. The text and the texture and timbre of the piano accompaniment at the end of the song recall the loneliness of the second section, but the voice is sweeter—mingled with the optimism of the third and fourth sections. The last line reflects that, despite the optimistic



tone of the celebratory sections preceding it, the underlying emotional concerns have not been resolved. As the centrepiece of the album, the song also encapsulates the complex combination of emotions expressed in the album as a whole, and, in its last lines of text, the ambiguity of whether the protagonist is robot or human, or perhaps both.

***Track 8: “Get Lucky” (writing credits to Bangalter, de Homem-Christo, Nile Rodgers, and Pharrell Williams)***

The voice of Pharrell Williams returns in this song, which is another up-tempo dance track, with a standard intro–verse–pre-chorus–chorus–post-chorus form, with all sections repeated, then the chorus and post-chorus repeated out. The instrumentation includes guitars, keyboards, synthesizers, bass, and drums. Like the other “happy dance tracks” on this album, the PAD scale reading based on Williams’ voice is Pleasure/Arousal/Dominance, and the MIT chart category of “joy” applies, with a faster tempo, higher and wider pitch range, high intensity, and breathy vocals with smooth upward inflection. Descriptive terms from the Parrott chart include: Joy–Zest–Enthusiasm, Excitement, Thrill, Exhilaration, Joy–Optimism–Eagerness, Hope, and Joy–Cheerfulness–Delight, Elation, Satisfaction, and possibly others from the tertiary lists of each of those primary and secondary categories. An additional dimension is added by Love–Lust–Arousal, Desire, Passion, and Infatuation. For Plutchik’s wheel, Joy and Ecstasy apply, and also Trust, Admiration, and Acceptance.

At 3’38”, after two times through the form, vocoder voices take over in the post-chorus, singing chords and rhythms that had been in the guitar part with an emotional feeling as happy and energized as Pharrell Williams’ voice had in the previous parts of the song. Beginning at 3’43” additional vocoder voices are layered over that sound like a combination of voices and solo guitar. Williams’s voice returns at 4’08” with the pre-chorus, sung over the continuing vocoder voices. At 4’25”, the vocoder voices drop out; Williams sings the chorus and continues to several final presentations of the post-chorus, prior to an instrumental repeat and fade. Despite these changes of texture and timbre that add interest to the final sections, the overall emotional expression is consistent from the beginning to the end of this track.

***Track 9: “Beyond” (writing credits to Bangalter, Caswell, de Homem-Christo, and Paul Williams, Jr.)***

This track begins with 45 seconds of overwrought instrumental introduction, worthy of an adventure movie, leading up to the entrance of vocoder voices over a light accompaniment of guitar and drums. The instrumentation for the remainder of the track is guitar, pedal and lap steel, keyboards, synthesizers, bass, and drums. The vocoder voices are strongly processed: they sound hooded, words are slightly slurred, and they have over-articulated consonants and vowels. At 1’58”, another vocoder-processed voice (probably that of Paul Williams, but it is not recognizable as his) enters on the text “You are the night, you are the ocean”. This solo voice is low-pitched, likewise hooded, and has over-articulated consonants and vowels; it also sounds slightly nasal. At the text “To find our way” another voice (or perhaps the same one, but it is in a much higher range) takes over the solo part; this voice has strongly slurred words, but otherwise seems to be processed in a similar manner to the others. At the text “it is the birthplace of your dreams” other vocoder voices join the soloist. A lengthy instrumental passage concludes the song.

Though there are different voices and different vocal textures in this song, the emotional content seems consistent throughout. My PAD scale reading is Pleasure/in the middle of the Arousal scale/between Dominance and Submission. Using the MIT table, there are precise but also slurred words, moderate energy, and (mostly) low-pitched voices, which does not correspond to a specific emotion. Using Plutchik's wheel, the emotional content seems to be Joy/Serenity, Optimism, and Anticipation, and Parrott's terms Joy-Optimism-Hope and Joy-Contentment match the emotional content of the voices, but the emotions are not as easy to pin down in this track as most of the others, in part perhaps because it is reflecting an emotional state "beyond love".

***Track 10: "Motherboard" (writing credits to Bangalter and de Homem-Christo)***

A computer's motherboard is the main circuit board to which all other components are attached, including the CPU (Central Processing Unit), ROM (Read-Only Memory), and RAM (Random Access Memory), as well as the communication features of the computer such as the USB (Universal Service Bus) connectors. The RAM cannot be accessed without its connection to the CPU through the motherboard. This track is purely instrumental, but the primary emotion conveyed by the instrumental parts (including full orchestra), like those of Track 3 seem to be representative of the top three petals of Plutchik's wheel—including Interest, Optimism, Joy, Serenity, Love, and Acceptance, expressed by the tempo, as well as the character of the melodies. From 3'06" to 4'06" there is a disruption to the serenity—something has gone wrong, and fragments of memories emerge that are disturbing and nightmarish—but the motherboard theme finally re-emerges from the chaos and regains control.

***Track 11: "Fragments of Time" (featuring Todd Edwards, writing credits to Bangalter, de Homem-Christo, Todd Imperatrice)***

This track features vocals by Todd Edwards, accompanied by guitar, pedal steel, keyboards, synthesizers, bass, drums, and percussion. Edwards, like Pharrell Williams, has a flexible and expressive voice, which does not sound like it has been altered. The emotion conveyed by the voice is consistent throughout the song. Using the MIT chart, its faster tempo, higher voice, breathy, upwardly inflected vocals reflect "joy". On the PAD scale, this track falls under Pleasure/Moderate Arousal/Dominance, and at Joy-Serenity on Plutchik's wheel. Using Parrott's terminology, Joy-Contentment-Pleasure, Joy-Cheerfulness-Gladness, and Love-Affection-Fondness/Liking seem apt descriptors.

***Track 12: "Doin' It Right" (featuring Panda Bear, writing credits to Bangalter, de Homem-Christo, Noah Lennox [Panda Bear])***

The last track with sung vocals features Noah Lennox, better known as Panda Bear of the band Animal Collective. Other than the vocals by Lennox and Daft Punk—using vocoder processed vocals as usual—the track is the only one on the album that is completely electronically produced, using their modular synthesizer. This dance track opens with over a minute of repetitive lyrics sung by vocoder voices like those of "Harder, Better, Faster, Stronger" from Daft Punk's second album. When Lennox's voice enters, cross-rhythms between his slower, syncopated vocal (bars of four dotted semiquavers plus a crotchet in 4/4 meter) floating over the continuing stream of semiquavers in the robotic vocoder

voices make an interesting temporal feel of distinct metrical layers, though they coordinate to the same backbeat. His voices does not seem processed until the vocoder voices drop out, just prior to the lyric “If you lose your way tonight”; at that point Lennox is overdubbed, perhaps with his own voice, and the crotchet melody is right on the beat—no longer syn-copated. When that text returns, the vocoder voices join Lennox, again creating the feeling of two distinct metrical layers, prior to dropping out just prior to the end of the track.

Like several of the tracks just prior to it on the album, the PAD descriptor is Pleasure/Medium Arousal/Dominance, and the overall effect based on Plutchik’s wheel is Joy-Ecstasy, along with Optimism. Terms from Parrott include Joy-Zest-Enthusiasm, Excitement, Exhilaration and Joy-Optimism-Hope. The breathy, upwardly inflected, higher intensity, fast and slow, higher voice correspond to “joy” on the MIT chart.

***Track 13: “Contact” (writing credits to Bangalter, de Homem-Christo, Stéphane Quême, Garth Porter, Tony Mitchell, Daryl Braithwaite)***

This track does not have any sung vocals, but it does open with a clip of Captain Eugene Cernan from the Apollo 17 space mission, which was used by permission of NASA and the speaker. Cernan’s voice is distorted because of transmission from space. This track is the only one on the album to use a sample of music by another artist—from “We Ride Tonight” by the Australian rock band The Sherbs (the last three individuals given writing credits). It was co-produced by DJ Falcon (Stéphane Quême), who also prepared some of the modular synthesizer parts. This track likewise is optimistic, with the electronic swoops reaching upward above the keyboard parts, and finally reflecting the departure from earth into the void of space, closing the album with the feeling that the interactions between humans and machines could have a positive outcome.

**Conclusions: Human vs. Post-Human**

Based on the previous discussion of the individual tracks from *Random Access Memories*, it is apparent that Bangalter and de Homem-Christo have achieved their stated goal of reflecting a variety of emotions through the voices of this CD. The only one of the primary emotions identified by the four systems employed here that did not appear is Surprise, and it is not clear (to me at least) how one would represent that emotion using a singing voice, robotic or otherwise (though it is possible with a speaking voice).<sup>29</sup> The overarching instigators of the emotions expressed in the songs are attempts on the part of the protagonist to establish relationships with others; these attempts lead both to the joys of positive interpersonal relationships of various kinds, and the crushing sadness and loneliness when those relationships fail. These emotions are certainly a part of human experience.

The title of the album refers to random-access computer memory (RAM), which allows repetitive data read/write functions to be done quickly no matter where the data ends up being stored in the RAM. Human memories are also random-access, but human minds sometimes bring back memories in an episodic and unpredictable way, with one memory triggered by another—as they seem to be in these songs, represented both in the shifts in emotional content from one song to the next within the group, and in individual songs where the emotions expressed vary during the track. Memories linked with strongly emotional times in one’s life tend also to be remembered and recalled “encoded” with the original emotion. As was the case with the Kismet experiment where creating an expressive

robot is helping scientists understand better what it means to be human, close investigation of the voices in this album illuminates how emotions may be expressed by voices, whether human or electronically processed. It is not clear from the album content whether the male protagonist whose memories are being accessed is human, a robot, or perhaps a post-human artificial intelligence of some advanced type. Do the robotic voices represent humans who have been processed in some way, or are they robots who have achieved (or can mimic) a degree of humanity? In any case, some of the most touching moments on the album, and indeed the most human expressions of emotion, come through the robotic voices: voices made by two men who, despite their longstanding intense engagement with music technology both past and present, are “human after all.”

### Notes

- 1 See the Wikipedia article “Talk box” for an extensive list of artists using this technology.
- 2 *Random Access Memories* won Grammy Awards for Album of the Year, Best Dance/Electronic Album and Best Engineered Album, Non-Classical, and “Get Lucky” won for Record of the Year and Best Pop Duo/Group Performance at the 56th Annual Grammy Awards in 2014.
- 3 Jesse Dorris, “Robocall: A Conversation with Daft Punk,” *Time* (21 May 2013). Available online at <http://entertainment.time.com/2013/05/21/robocall-a-conversation-with-daft-punk%E2%80%A8%E2%80%A8-%E2%80%A8%E2%80%A8/>. Accessed 3 December 2017.
- 4 *Ibid.*
- 5 For a detailed comparison of the two soundtracks see Elizabeth A. Clendinning, “Creating ‘the Ultimate Retro-Future’: Music, Nostalgia and Futurity in *Tron* (1982) and *Tron: Legacy* (2010),” *Norient (Academic)*, March 2015. Available online at <https://norient.com/academic/the-ultimate-retro-future-music/>. Accessed 29 November 2017.
- 6 “Daft Punk: ‘Why We Dropped Synths for Strings for “TRON” soundtrack,’” *NME.com* (19 November 2010). Available online at [www.nme.com/news/music/daft-punk-123-1302157](http://www.nme.com/news/music/daft-punk-123-1302157). Accessed 29 November 2017.
- 7 *Ibid.*
- 8 Drew Tewksbury, “Daft Punk Pull Back the Curtain on ‘Tron: Legacy’ Soundtrack,” *The Hollywood Reporter* (16 December 2010). Available online at <https://www.hollywoodreporter.com/news/daft-punk-pull-curtain-tron-60965>. Accessed 3 December 2017.
- 9 Kate Lunau, “The Canadian Who Makes Daft Punk Pop,” *McClean’s* (20 June 2013). Available online at [www.macleans.ca/culture/the-canadian-who-makes-daft-punk-pop/](http://www.macleans.ca/culture/the-canadian-who-makes-daft-punk-pop/). Accessed 3 December 2017.
- 10 Dorris, “Robocall: A Conversation with Daft Punk.”
- 11 Zach Baron, “Daft Punk Is (Finally!) Playing at Our House,” *GQ* (7 May 2013). Available online at [www.gq.com/story/daft-punk-random-access-memories-profile-gq-may-2013](http://www.gq.com/story/daft-punk-random-access-memories-profile-gq-may-2013). Accessed 3 December 2017.
- 12 Paul Tingen, “Recording Random Access Memories | Daft Punk: [An interview with] Peter Franco & Mick Guzauski,” *Sound on Sound* (July 2013). Available online at [www.soundonsound.com/people/recording-random-access-memories-daft-punk](http://www.soundonsound.com/people/recording-random-access-memories-daft-punk). Accessed 3 December 2017.
- 13 Daft Punk, *Random Access Memories-The Collaborators: Giorgio Moroder*. Available online at [www.youtube.com/watch?v=eYDvxo-M0OQ](http://www.youtube.com/watch?v=eYDvxo-M0OQ). Accessed 3 December 2017. The relevant section begins at 4’15”.
- 14 Jonah Weiner, “Exclusive: Daft Punk Reveal Secrets of New Album,” *Rolling Stone* (13 April 2013). Available online at [www.rollingstone.com/music/news/exclusive-daft-punk-reveal-secrets-of-new-album-20130413](http://www.rollingstone.com/music/news/exclusive-daft-punk-reveal-secrets-of-new-album-20130413). Accessed 3 December 2017.
- 15 These particular paradigms were selected for inclusion because they are frequently referenced by recent social psychology research on human emotions and in university courses and textbooks addressing this topic. They are considered foundational in that field.

- 16 Paul Ekman and Wallace V. Friesen, "Constants Across Cultures in the Face and Emotion," *Journal of Personality and Social Psychology*, 17 (1971): 124–129.
- 17 Paul Ekman, "Basic Emotions", in *Handbook of Cognition and Emotion*, edited by Tim Dalgleish and Mike Power, 45–60 (Sussex, UK: John Wiley & Sons, 1999).
- 18 Albert Mehrabian, *Basic Dimensions for a General Psychological Theory: Implications for Personality, Social, Environmental, and Developmental Studies* (Cambridge, MA: Oelgeschlager, Gunn & Hain, 1980), 39–53.
- 19 Robert Plutchik, "Theories of Emotion," in *Emotion: Theory, Research, and Experience I* (New York: Academic, 1980).
- 20 W. Gerrod Parrott, *Emotions in Social Psychology* (Philadelphia, PA: Psychology Press, 2001).
- 21 David Huron, "On the Science of the Sublime: How Music Takes Your Breath Away," unpublished paper presented at *Music Theory Southeast* 2017.
- 22 Current information about the Kismet project, including video clips, is available at the MIT (Massachusetts Institute for Technology) Artificial Intelligence Laboratory Humanoid Robotics Group website: [www.ai.mit.edu/projects/humanoid-robotics-group/kismet/kismet.html](http://www.ai.mit.edu/projects/humanoid-robotics-group/kismet/kismet.html).
- 23 Because the musicians wear full-body costumes and their helmets do not change facial expression, and because their body postures are determined by the instruments they are playing (guitars) or manipulating (synthesizers), the lack of information from facial expressions and body postures is consistent in live as well as recorded performances.
- 24 Weiner, "Exclusive: Daft Punk Reveal Secrets of New Album."
- 25 Kerri Mason, "Daft Punk on EDM Producers: 'They're Missing the Tools,'" *Billboard* (6 May 2013). Available online at [www.billboard.com/articles/columns/code/1560708/daft-punk-on-edm-producers-theyre-missing-the-tools](http://www.billboard.com/articles/columns/code/1560708/daft-punk-on-edm-producers-theyre-missing-the-tools). Accessed 3 December 2017.
- 26 Kevin Perry, "Daft Punk: 'We Don't Have Egos, We Have Superpowers,'" *New Musical Express* (14 May 2013). Available online at <https://kevinegperry.com/2013/05/14/daft-punk-interview-we-dont-have-egos-we-have-superpowers/>. Accessed 3 December 2017.
- 27 Kathy McCabe, "Daft Punk's Human Touch in New Album Random Access Memories," *Herald Sun* (Australia), 8 May 2013. Available online at [www.heraldsun.com.au/entertainment/daft-punk-find-the-human-touch/news-story/8a61a30b7efbaadd35fb295a3d53a979?sv=ee4b28d076a07e1a8a48112708553113](http://www.heraldsun.com.au/entertainment/daft-punk-find-the-human-touch/news-story/8a61a30b7efbaadd35fb295a3d53a979?sv=ee4b28d076a07e1a8a48112708553113). Accessed 29 November 2017.
- 28 Dorris, "Robocall: A Conversation with Daft Punk."
- 29 Perhaps it is not possible for robots to be surprised, even if they have absorbed all other possible human emotions. The MIT scientists are working on how to make Kismet look and sound surprised, even if the emotion is triggered through analysis of the interactions with humans.