



Perspectives on Jazz Synthesizer Improvisation:

Analyzing Recorded Solos by Jan Hammer,
Joe Zawinul, George Duke, Chick Corea, and
Michael Brecker

VISA-PEKKA OSKARI MERTANEN

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Visa-Pekka Oskari Mertanen (Visa Oscar)

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ABSTRACT

Mertanen, Visa-Pekka Oskari (2025). *Perspectives on Jazz Synthesizer Improvisation: Analyzing Recorded Solos by Jan Hammer, Joe Zawinul, George Duke, Chick Corea, and Michael Brecker*. Sibelius Academy of the University of the Arts Helsinki. EST Publication Series 84.

This thesis studies different perspectives on jazz synthesizer improvisation by examining five recorded solos: “Celestial Terrestrial Commuters” [*Birds of Fire*], “Black Market [8:30]” “Brazilian Sugar” [*Brazilian Love Affair*] “Got A Match?” [*Chick Corea Electric Band*] and “Gossip” [*Michael Brecker Band Live*] as well as published interviews of their original performers: Jan Hammer (1948-), Joe Zawinul (1932-2007), George Duke (1946-2013), Chick Corea (1941-2021) and Michael Brecker (1949-2007).

The primary research method employed is artistic practice-based, which consists of self-learning by aural imitation and music theory analysis. In the research process, synthesizer solos from the original recordings were imitated, transcribed, and analyzed. The source material comprises four doctoral concerts, audio recordings, videos, books, scholarly articles, magazine articles, and internet sources. The studied solos and accompanying parts were transcribed by the author and chosen from the repertoire of the doctoral concerts in which the author performed original compositions and music frequently performed by the studied musicians. The analysis brings out the contextual background, synthesizer setups, and sound design. The transcription analysis focuses on rhythmic and melodic-harmonic phenomena such as scale choices, note choices, patterns, nuancing, timbral qualities, form, and tension control. At the end of each section covering a solo, there is a summary of the most essential qualities of that solo, along with an imitation video by the author.

The findings show that the critical elements in jazz synthesizer soloing are mastering the improvisatory languages of the jazz tradition and adjusting the playing style to each sound’s acoustic character. The studied solos demonstrate different ways of nuancing the notes with continuous controllers and manipulating the sound’s timbral qualities to keep the synthesizer sound expressive and exciting. A comparison chart of the studied musician’s personal data, song information, improvisational concepts, synthesizer setups, solo sound characters and realtime controllers found in the five solos is presented at the end.

Keywords: jazz, jazz fusion, jazz-rock, jazz improvisation, artistic research, jazz scholar, synthesizer, signal-processing device, transcription, Imitation-Assimilation-Innovation.

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1 INTRODUCTION

1.1 MAIN GOALS AND BACKGROUND OF THE STUDY

This thesis presents different perspectives on jazz synthesizer improvisation by studying five solos recorded between 1972 and 1989. I have gathered, organized, and analyzed the data using artistic research methods based on the jazz tradition, such as aural imitation and transcription, as well as standard jazz theory methods such as Roman numeral analysis, scale analysis, and the analysis of non-harmonic notes. The study aims to highlight the interesting concepts and tools of jazz improvisation found in the titles “Celestial Terrestrial Commuters” [*Birds of Fire*], “Black Market [8:30]”, “Brazilian Sugar” [Brazilian Love Affair], “Got A Match?” [*Chick Corea Electric Band*] and “Gossip” [*Michael Brecker Band Live*] and how their performers Jan Hammer (b. 1948, piano & keyboards), Joe Zawinul (1932–2007, piano & keyboards), George Duke (1946–2013, piano & keyboards), Chick Corea (1941–2021, piano & keyboards), and Michael Brecker (1949–2007, saxophone & EWI) have utilized synthesizer’s expressive possibilities in these solos.

The reason for selecting these titles was to concentrate on solos performed by jazz musicians who based their expression on understanding the tonal jazz language¹ but chose a synthesizer as their primary solo voice. Studying synthesizer improvisation by musicians who started their career in an era when hard-bop was the dominant idiom is essential because during the bop era, “a concentration of virtuosos forged and refined many practices that have remained conventions of the language of jazz” (Berliner 2021, p. 27). The musicians studied here also belong to roughly the same generation of jazz musicians who started their professional careers on acoustic instruments. As the popularity and availability of the synthesizer began expanding in the early 1970s, these musicians expanded (or switched) their improvising focus to synthesizers and signal-processing devices. They were enthusiastic about the synthesizer’s new sonic possibilities, and they had the urge to adapt their jazz expression to fit the new instrument. There are, of course, other notable jazz players who improvise on synthesizers and come from a similar background as the studied musicians. For example, keyboardist Herbert Jeffery “Herbie” Hancock (b.1940), guitarist Patrick Bruce “Pat” Metheny (b.1954), saxophonist Robert Alan “Bob” Mintzer (b.1953), and multi-instrumentalist Sun Ra (born Herman Poole Blount, 1914–93). I have excluded them only since I feel that the chosen five already represent the most prolific synthesizer soloists of the era.

My thesis contributes to the young field of academic jazz synthesizer improvisation research. It shares common ground with general research exploring jazz improvisation and synthesizer studies. My research methods derive from practice-based artistic research. This study uses the educational concepts of NEA Jazz Masters Clark Terry² and David Liebman.³ I also utilize the knowledge I have received in private lessons and classes at the Sibelius

¹ I base my argument on these records: Jan Hammer “Goats Song” *Malma Maliny*, Joe Zawinul “Del Sasser” *Money In The Pocket*, George Duke “Pamukkale” on Jean-Luc Ponty’s *Jean-Luc Ponty Experience with the George Duke Trio (Live at Thee Experience/1969)*, Chick Corea “Chick’s Tune” on Blue Mitchell’s *The Thing to Do*, Michael Brecker “What is This Thing Called Love” on Jack Wilkins’ *Merge*

² Although Clark Terry did not publish works that would have defined his Imitation–Assimilation–Innovation process, several sources confirm that he taught this learning system throughout his life (Terry & Terry 2015; Freiman n.d.a; O’Donnell 2011; Kassel 2014).

³ David Liebman has described his studying concepts in *A Chromatic Approach to Jazz Harmony and Melody* (Liebman 1991) and in his blog post “The Complete Transcription Process” (Liebman n.d.a.).

Academy by Professor Jukkis Uotila and keyboardist/composer Jim Beard since 1998. I have found the most accurate printed jazz synthesizer improvisation analysis on artistic expression, musical parameters, keyboard setups, and sounds of the studied musicians in magazines such as “Keyboard”, “Downbeat Magazine”, and “Sound On Sound”. However, these articles usually offer surface-level analyses, as the magazines aim at a diverse audience. Secondly, they typically seek to cover a player’s entire career and style in a highly condensed space. Hence, they usually present only short transcriptions or samples of the artist’s recorded works pinpointing a stylistic trait or typical licks.

Although a large part of my work is purely self-developmental, I sincerely wish to bring forth new information that could benefit the whole jazz community. I encourage everyone to consider the aural Imitation-Assimilation-Innovation (IAI) process for achieving heightened creative insight. This thesis can deepen existing knowledge for jazz musicians who can play the included transcriptions and assimilate the concepts and phrases they like into their vocabulary. For a broader audience, it can provide exciting new information through organized transcription data and facts regarding jazz synthesizer history and technical solutions. I hope my transcriptions and analyses inspire fellow jazz synthesizer players to learn and develop the improvisation tools and concepts presented here. I would also like to provoke general discussion regarding the methods, conventions, and best practices of present-day jazz improvisation analysis and pedagogical tools.

The thesis is organized as follows: Chapter One defines the main objectives and the historical background. It contains citations from interviews where the studied musicians discuss why they initially became interested in synthesizers and their approach to jazz improvisation and composing. The first chapter also presents the research methods, terminology, and literature review. The synthesizer’s developmental history and brief overviews of the crucial synthesizer models are presented in chapter two. Chapter three analyses the five solos, including possible thought processes, improvisatory concepts, synthesizer sounds, and detailed solo transcriptions, including theory-based analysis on rhythmic and melodic-harmonic phenomena, scale choices, note choices, and patterns. In chapter four, I conclude the study by presenting different aspects of synthesizer improvisation. I deliver a detailed comparative summary of the improvisation concepts, equipment, and sounds extracted from chapter three.

1.2 JAZZ AND SYNTHESIZERS, FROM THE 1960S TO THE 1980S

1.2.1 The Birth of Jazz Fusion

In the 1960s, many jazz musicians and bands started distinguishing their sound, harmony, and form from the earlier hard-bop conventions. The development advanced simultaneously on several fronts. According to Jukkis Uotila, the modal jazz language, which had been brought to the attention of the general public by Miles Davis’ album *Kind of Blue* (Columbia 1959), had developed by the mid-1960s into more complex and dissonant chromatic language by innovators like Davis, John Coltrane, and McCoy Tyner (Uotila 2023).

At the same time, the free jazz movement, led by avant-garde musicians such as Ornette Coleman, Cecil Taylor, and Albert Ayler, sought challenges beyond the constraints of chord progressions, pre-composed melodies, swing, the Tin Pan Alley songbook, and predictable roles for ensemble players. They prioritized music that pressed

against boundaries, formal and interactive, some favoring a more literal brand of collective improvisation (Tucker & Jackson 2020, p. 38.)

By the late 1960s, rock, funk, and soul elements such as rhythms, vamps, riffs, song forms, and instrumentation started infiltrating original jazz compositions. Mainstream attention accrued to jazz-rock with recordings such as *In a Silent Way* (Columbia 1969) and *Bitches Brew* (Columbia 1970), where Miles Davis started experimenting with electric instruments, musicians coming from rock, and funk backgrounds, and modern post-production techniques. The umbrella term for jazz that included these musical and cultural elements was at first “jazz-rock” due to the domination of rock influences and instrumentation. As time went on, the terms “fusion” and “jazz fusion” overtook “jazz-rock” in usage as musicians continued to combine jazz elements with elements varying from soul, funk, and R’n’B to non-Western traditions from Spain, India, West Africa, South America, and the Caribbean (Pond 2013, pp. 1-5.)

Another notable source of the rhythmical and melodic-harmonic influence of jazz fusion was planted in the 1960s, as the Brazilian bossanova and samba recordings by artists such as Antonio Carlos Jobim and Joao Gilberto gained popularity in America (Tucker & Jackson 2020, p. 40). However, Uotila notes that during the first collaborations jazz musicians still utilized tonal jazz language and hard-bop conventions over Brazilian songs. It took almost a decade more for jazz musicians such as Chick Corea and Wayne Shorter to integrate Brazilian rhythms, harmonies, and melodies into their original jazz compositions in the early 1970s (Uotila 2023.)

Substantially, the modal/chromatic jazz language developed by John Coltrane, Miles Davis, and McCoy Tyner, as well as elements from the free jazz movement and Western art music, found their way into the jazz fusion expression. They were greatly favored over the tonal bop harmonies of the previous era.

Generally, the harmonic rhythm slowed down, allowing the improvisers to explore modes of the major scale, melodic minor, and exotic scales such as symmetric scales or scales borrowed from non-Western melodic systems, such as Spanish flamenco, Indian raga, or Middle Eastern maqām. Compositions often contained pedal points, static ostinatos, or vamps over which the nonfunctional harmonic progressions were projected. The rhythmic approach favored even eighth-notes common to the soul, funk, and Afro-Caribbean music traditions, and the use of swing eighth-note phrasing shrank down to sporadic double-tempo phrases. The commercial success of Dave Brubeck’s album *Time Out* (Columbia 1959) introduced asymmetric meters to the jazz context (Pond 2013, p. 2.) Uotila said it took another decade before the odd time signatures appeared frequently in the original compositions of jazz fusion artists such as John McLaughlin, Larry Coryell, and Tony Williams (Uotila 2023).

1.2.2 The Development of Jazz Synthesizer

Considering the circumstances mentioned in the previous section, it was no wonder that many jazz fusion synthesizer solos in the early 1970s were played over modal even-eight (duple-meter) songs. This became the paradigm of a jazz fusion synthesizer solo for many decades. Other simultaneous developmental paths also existed, most notably Jan Hammer’s performances on Elvin Jones’ records *Elvin Jones is “On the Mountain”* (PM 1975) and *The Prime Element* (Blue Note 1976), where Hammer improvised on a Minimoog in a straight-ahead jazz feel environment.

Jazz pianist Paul Bley experimented with Moog and ARP synthesizers between 1969 and 1972. Bley started his career by playing hard-bop but, at the end of the 1950s, gravitated towards the newly found free jazz movement. The album *The Paul Bley Synthesizer Show* (Milestone 1971) contains primarily open improvisation that highlights Bley's aesthetic ideas developed by his former collaborator Ornette Coleman (Gluck 2013, p. 322.) Bley gets a little closer to the jazz fusion sound on his record *Paul Bley and Scorpio* (Milestone 1973), which contains tighter time playing from the rhythm section and more rehearsed thematic material. Still, the synthesizer solos sound like free jazz-oriented sonic experimentations.

Generally, the early analog synthesizer sound shares many things in common with the direct electric tonewheel (Hammond) organ sound.⁴ However, the multi-layered modulation in pitch and amplitude provided by the organ's internal chorus/vibrato effect and the commonly used outboard Leslie speaker cabinet made the organ sound more natural (i.e., imperfect) and more accessible to fit in the hard-bop domain. Instead, the unaltered raw sound of an analog oscillator sound proved unnaturally perfect for the human ear. The tonewheel organ also featured unlimited polyphony to express lush jazz harmonies. The percussion settings and key click made the attack portion of the sound more articulated. In all fairness, the tonewheel organ had been around since 1935, so it also had about 35 years of head start on the synthesizer. The ideological spread between the early 1970s jazz-rock and the previous bop era, combined with the synthesizer's features discussed above, explains why most first-generation jazz synthesizer players did not gravitate toward the traditional hard-bop repertoire or improvising language.

It is challenging to play "hard swinging" eighth notes on a non-touch reactive monophonic synthesizer because the micro-level dynamic variation that the idiomatic jazz phrasing requires is difficult (if not impossible) to obtain. The ghost notes can be inserted from the lower register (with the left hand) with the filter keytracking on. This way, the lower notes have a lower filter cutoff and, thus, appear softer. A laid-back beat placement is another tool for better fitting the analog synthesizer sound to the tonal bop realm.

During the 1970s, many young musicians entered the new jazz fusion scene without a previous career in jazz, or even proper knowledge of the previous hard-bop and post-bop eras. It took time and specific output from important innovators before the new jazz fusion style was accepted and considered a continuation of the jazz tradition. A significant milestone for unification was, for example, Jaco Pastorius' recording of the be-bop era original "Donna Lee" (on *Jaco Pastorius*, Epic 1976), where Pastorius demonstrated how his improvised lines utilized the tonal jazz language (Uotila 2023). According to my research material, the ultimate proof of the synthesizer's feasibility for playing tonal jazz language was Chick Corea's original "Got A Match?" (GRP 1986) a decade later, where Corea's straight-ahead 16-bar theme was performed on an electric trio (synthesizer, bass, drums) but played in hard-bop fashion.

In the eyes of the jazz community, the synthesizer was searching for its niche throughout the 1970s. In some ways, this process was related to the overall prejudice against electric instruments in jazz. For example, the electric bass also struggled for credibility among jazz musicians, as it was "overwhelmingly associated with rock and funk music and therefore carried with it the stigmatized connotations of outsider status" (Wright 2020, p. 121). As the following stories prove, synthesizers were often introduced to the jazz context in a "coloring" role but were rejected

⁴ For example, no keyboard velocity, accurate pitch, fast attack and infinite sustain without decay.

in the primary comping and soloist roles. Several jazz musicians, tempted by the new possibilities, went through a search period to find the role of the synthesizer in their expression.

The following story sheds light on the path many musicians took with the synthesizer, although it concerns a musician not studied in this thesis, Herbie Hancock. Since Miles Davis' "Miles in The Sky" studio sessions in 1968, Hancock had been using the electric piano on the side of the acoustic piano. Gradually, he started spicing up the electric piano sound with different signal-processing devices such as distortion, wah-wah, chorus, phaser, and Echoplex tape delay. As time passed, his search for new sounds and his genuine interest in electronics started gravitating toward synthesizers. The final push to incorporate synthesizers on a recording came from David Rubinson, who had been assigned to produce Hancock's solo records for Warner Brothers. Rubinson had a history with electronic and electro-acoustic music. Already in 1967 he had incorporated textural sound design and effects made on a Moog Modular into a rock song, "Hard Coming Love", by the band United States of America. Rubinson sent Hancock to the studio of synthesist Patrick Gleeson to learn how to play and program the new instrument. Gleeson was a former professor of literature who abandoned academia to become a part of the electro-acoustic scene of the San Francisco Tape Music Center. He was influenced by the works of Morton Subotnick, Steve Reich, and Terry Riley. Hancock brought the song "Quasar" (composed by Benny Maupin) with him and asked Gleeson to give him an idea of what the synthesizer could bring to it. Gleeson prepared some Moog III patches, assuming Hancock would play the actual takes. To make the sounds, Gleeson played a mock-up on the keyboard, and to his great surprise Hancock encouraged him to record the actual takes as well. He encouraged Gleeson to continue and returned after a few days to hear the results. In the end, Hancock was so pleased that he invited Gleeson to become a member of his Sextet and join them on tour. At first, the other band members doubted the role and esoteric sounds of the ARP2600 that Gleeson had acquired for the tour. Gradually, the synthesizer effects and melodies were accepted as a part of the unique Mwandishi band sound (Gluck 2008, pp. 3-4.)

However, Hancock publicly played synthesizer parts and solos in his next major band concept, the Headhunters, in 1973. Throughout his career, Hancock has rarely used the synthesizer as a primary solo voice for delivering jazz content (with a few notable exceptions) since he had predominantly played solos containing extensive jazz vocabulary on acoustic and electric pianos. I believe his blues or sound effect-oriented synthesizer solos (especially when performed on a keytar) have been merely a means to connect with the audience. Building and enhancing the connection with the audience also played a significant role for the other studied musicians as they chose to improvise on the synthesizer.

The semi-modular ARP 2600 gradually found its way to Joe Zawinul's Weather Report touring setup at the end of 1972. Before that, it was heard briefly on the song "Unknown Soldier" from the band's 1971 album *I Sing the Body Electric*. The sounds were programmed and played by a keyboardist and ARP associate, Roger Powell, based on Zawinul's cues. The first gig where Zawinul publicly used the ARP2600 in Weather Report was at the "Bitter End", a small club in Greenwich Village, New York. In the gig, Zawinul mostly used the ARP2600 to create random note sequences triggered by the sample & hold waveform controlling the oscillator pitch. In this case, only a single note press was required from Zawinul to start the sequence. Then, the band joined in for a free jam. As Zawinul began touring with the ARP2600, it was still mainly used for coloring purposes, "A mere gadget for the unimagi-native" according to one concert review. He quickly encountered various technical problems as the ARP2600 was a hand-made lab instrument rather than a roadworthy gigging tool. Weather Report's sound engineer, Brian Risner,

had to learn to service the ARP2600 before every gig. He soon made various modifications and replaced components with new designs sent for testing from the ARP factory. Due to the constant technical problems, Zawinul bought another unit to function as a spare onstage in case something went wrong. He soon found a way to play both live and discarded the idea of a spare unit, and the legendary setup of two ARP2600 units nicknamed “eins” and “zwei” was born. Later, Risner added a metal stand combining the two into one unit onstage and added a tray for effect pedals (Bianchi 2021, pp. 120–121, 139–141.) According to my research based on the available recordings and interviews, Zawinul started using the ARP2600 as his primary solo voice between 1973 and 1974.

As I will demonstrate later in my thesis, Jan Hammer knew already in August of 1972 that he wanted to hear the synthesizer as a primary solo voice in his improvisation. In a recent interview, he solidified my argument “With me, it was not a question of the synthesizer as an orchestrating tool or color; with me, it was just a straight-ahead solo voice, like Miles – monophonic solo improvisation – that’s what really made me; that was my voice” (Cole 2023). At the time, the Moog Minimoog Model D, which featured an intuitive fixed signal chain topology, approachable pitch bend, modulation wheels, and a familiar organ-like keyboard, best supported his vision and needs.

According to George Duke’s memorial homepage, *Faces in Reflection* was the first George Duke solo record to contain synthesizers. Guitarist and band leader Frank Zappa introduced synthesizers to Duke, but it took some time and trial and error before he found his first solo voice with the ARP Odyssey. Although Zappa gave Duke the initial push, Duke admits he later became drawn to the synthesizer’s possibilities (Duke Music Trust 2021.) The record contains plenty of over-dubbed synthesizer melodies and solos.

For Chick Corea, the decision to start using synthesizers was part of an ideological change. After the success of his first incarnation of Brazilian-influenced and mostly acoustic Return to Forever (albums *Return to Forever* and *Light as a Feather*), the jazz-rock scene was rapidly developing towards loud and energetic rock-oriented electric sounds along with bands like The Mahavishnu Orchestra and The Weather Report. The decision to use the electric guitar leads and synthesizers originated in Corea’s quest to find more efficient and familiar ways to communicate with the audience. The second and electric incarnation of Return to Forever was received enthusiastically but also affected the audience demographics. They lost some of their earlier jazz fans but gained many new, younger rock audiences. The band started playing in larger venues and sharing stages with bands such as Fleetwood Mac and David Bowie (Hertzog 2017, pp. 41–47.)

The first album featuring synthesizers was the 1974 Return to Forever album, *Where Have I Known You Before*. On that album, Corea predominantly used two typical monophonic analog synths, the Minimoog and the ARP Odyssey, for various lead and bass parts. The synthesizer solos were overdubbed on a Minimoog over single-chord bass vamps or slowly moving modal harmonies.

Nyle Steiner’s inventions, the EVI and the EWI grabbed Michael Brecker’s attention for two reasons. For some time, Brecker had suffered from a herniated larynx problem. This was caused by severe overblowing in loud band environments, and a botched surgery in 1973 aggravated the issue. He feared he would be unable to play the saxophone for much longer, as blowing caused increasing pain and inflammation around the neck. He was trying to solve the issue with custom-made mouthpieces, and finally found one by Dave Guardala that enabled him to keep playing the saxophone. The Electric Wind Instrument (EWI) required far less pressure, and also offered a way for Brecker to connect with the world of music technology and synthesizers. However, he admitted that one of the

biggest original motivators for picking up the EWI was the fear that someday he would no longer be able to play the saxophone (Milkowski 2021, pp. 204–207.)

As time passed, the EWI became a much more important expressive tool for Brecker than just a backup for his saxophone. According to the available recordings, Brecker started playing the EWI around 1985. There are already many synthesizers on the Steps Ahead album *Modern Times* (1984), but no EWI. On the next album, *Magnetic* (1986), Brecker demonstrated great control of the Steinerphone EWI and complex, layered sounds that required MIDI and CV control of several external sound modules. EWI is also mentioned in the *Magnetic* album credits for the first time.

In a 1987 “Music Technology” magazine interview, Steps Ahead sound engineer Dennis Alichwer discussed Brecker’s early EWI setup. He mentioned the analog Steinerphone EWI and how it “converted CV to MIDI and controlled the Oberheim Xpander analog synthesizer module, Yamaha TX7 FM-synthesizer module, and Akai 612 sampler” (Rose and Fradkin 1987).

1.2.3 Expression Beyond Piano

To better understand why and how the studied musicians became interested in the emerging instrument in the first place, let us look at what they have said about the subject in interviews, articles, and books. In a 2004 “Sound On Sound” magazine article, Jan Hammer opened up about his original motives in the early 1970s for starting to explore the synthesizer: “It was an ongoing process where the piano was eventually not enough” (White 2004, p. 2). Among many other keyboardists, Hammer had started playing electro-mechanic keyboards (mainly Rhodes electric piano) a few years earlier and experimented with their possibilities. This included external signal-processing devices such as distortion, envelope filter, ring modulator, and tape echo to broaden the sonic spectrum and achieve a personal sound. However, the fundamental restrictions of a piano-like instrument remained. A single note on a piano decayed fast, and there was relatively little to be done with a note after its attack. “I wanted the tonal quality of bending notes and adding vibrato and all that” (White 2004, p. 2). The possibilities the synthesizer could offer in pitch manipulation were unmatched compared to any previous keyboard instrument. It provided options for coloring the long notes, such as changing the filter cutoff, modulating the oscillator pitch for vibrato, and nuancing the notes with the pitch bend. Notes could also sustain forever or decay at an adjustable rate. “It really started in the Mahavishnu Orchestra when I was looking for something to cut through that incredibly busy sound that we were creating. I had to have a sound that would project, so I used guitar amps and that’s when the sound got really exciting” (White 2004, p. 2).

These statements from Hammer suggest that he already saw the potential of playing single-note lines that would be heard over the loud sonic environment he was in. He could nuance each note easily and play even the fastest runs lightly without losing the aggressive sound and overall loudness. Unlike acoustic pianos and electro-mechanic keyboard instruments, synthesizer sound can be amplified and post-processed enormously without feedback, because the sound is created in electronic circuits (oscillators) and no microphones are needed in the reinforcement process.

Joe Zawinul was often questioned about using the synthesizer as his primary solo instrument instead of the piano. He was usually annoyed by the question. The following quote is one of his most polite yet compact answers that summarizes the essential: approaching every synthesizer sound like an arranger according to the sonic features of the current sound.

An instrument is not important. It is the way one plays that is important. Instruments don’t play by themselves. A piano is certainly not a better instrument than a synthesizer, but if a synthesizer is played like a piano, it becomes a very bad instrument. It doesn’t work. You can’t play a trumpet like a violin – it doesn’t go. That’s the problem – the players, not the instrument. (Prasad 1997)

George Duke’s story is a different one. He happily played the piano, but his current employer [Frank Zappa] persuaded him to explore the new instrument for his band’s needs. “I was pretty crazy on the piano. I thought I was the John Coltrane of piano...He [Frank Zappa] would sit me down and just say, ‘Look, you need to play synthesizer’...Frank was very much responsible for the ideas that I incorporated, not only then, but later” (Kirby 2020, p. 8).

Duke openly credited Frank Zappa as the visionary who first saw the potential of the synthesizer. Later, Zappa’s ideas started growing in him as well. Once Duke became interested in the synthesizer, Zappa lent him

different models to try. The most appealing ones to Duke were straightforward compact models like the Minimoog and ARP Odyssey, which featured somewhat intuitive user interfaces and thus did not require lots of engineering skills. After hearing Jan Hammer play the Minimoog in the Mahavishnu Orchestra, Duke decided to play the ARP Odyssey in Zappa's band (Ekers 2012, p. 3.) Eventually, he played both instruments during his career.

Chick Corea often stressed communication with the audience as his primary goal. Corea saw music and art as spiritual forms of awareness and communication that are more flexible and personal than objectivity-bound scientific theories. "Music is an expression and communication of an intent and an emotion. Music has a message and uses physical sounds to communicate emotions" (Corea 2002, p. 15).

When asked about the reasons behind his relentless interest in the EWI, Michael Brecker replied: "It's a way for wind players to be able to participate directly in this digital revolution that's been happening. It's an immensely wide direction for expression" (Walters 1987, p. 8). The comment reveals how Brecker was completely convinced about the emerging possibilities. He saw synthesizers and signal-processing devices as promising outlets for creativity that he did not want to miss. At the time, Brecker did not address his emerging health issues that were also contributing to instrument choices, as explained in the previous subchapter.

1.3 RESEARCH METHODS AND MAIN CONCEPTS

1.3.1 Artistic Research

This thesis is a part of my artistic doctoral degree with five artistic components: four doctoral concerts and a CD album release. While the four doctoral concerts focused on gathering research material (transcriptions) and imitating the studied musicians' original compositions, sounds, and improvisational concepts, the Visa Oscar album *Looking Back, Reaching Forward* contained original compositions and improvisation based on the previous artistic work. Through the artistic research process, I became aware of several approaches the studied musicians used in improvisation. In the doctoral concerts, I aimed to mirror the improvisational concepts of the studied musicians. I strove for similar-sounding ideas that I could extract from their solos. While making the Visa Oscar CD album, I imagined how each studied musician would sound if they improvised over my original songs. This gave me a rich palette of possibilities, more detailed thoughts, and a degree of melodic freedom that I did not possess earlier.

Academic, artistic research in jazz is still finding its place and definition in academia, yet "the debates regarding its compatibility and equivalence with the scholarly/scientific approaches are ongoing but diminishing" (Kahr 2022, p. 17). In the context of learning the jazz tradition and its essential improvisatory concepts, a long-lasting history of analytical, artistic praxis exists, which is both well-known and accurately described, for example by NEA jazz trumpeter and educator Clark Terry in the Imitation-Assimilation-Innovation process⁵ or NEA jazz saxophonist and educator David Liebman in "The Complete Transcription Process" (Liebman n.d.a.). The Sibelius Academy's jazz department already has two decades of history in postgraduate artistic practice-based jazz improvisation research that relies on aural imitation, transcription, theoretical analysis, and high-level musician skills in

⁵ See footnote on page 6.

jazz. Since our first doctor, Jari Perkiömäki, in 2002, most doctoral candidates⁶ have utilized artistic research methods inherent to the jazz tradition. The International Network of Artistic Research in Jazz (INARJ), with its broad network of researchers and biannual Symposium, has done significant work in defining artistic research in jazz as “research *in* and *through* art, usually conducted by artist-scholars, and it differentiates itself from the more traditional research *on* art” (Kahr 2022, p. 17). From the musicology side, Dr. Erkki Huovinen’s book *Musiikillinen Improvisaatio: Keskustelunavauksia Soivan Hetken Kulttuureihin* presents Finnish essays on improvisation in different forms and genres. The book aims to “approach and shed light on the starting points and processes of making music in a wide variety of musical contexts—in a way that gives the musician and his/her skills, perceptions, and cultural heritage the value they deserve” (Huovinen 2015). The article “Dramaturgical and music-theoretical approaches to improvisation pedagogy” compares “the relative merits of two approaches to teaching musical improvisation: a music-theoretical approach, focusing on chords and scales, and a ‘dramaturgical’ one, emphasizing questions of balance, variation and tension (Huovinen et. al. 2011). The article does not address jazz improvisation specifically, but contains several references to books on jazz improvisation in literature concerning improvisation in other genres.

In the academic context of performance analysis specific to jazz improvisation, Barry Kenny offers five specific areas of theoretical analysis (Kenny 1999 pp. 59–66). I have listed them in the order they are presented in Kenny’s article, together with the surnames of the scholars that have contributed to that particular field of study.

- Chord-Scale Theory (Mehegan, Birkett)
- Formulaic Analysis (Abersold, Owens, Kernfeld)
- Motivic Analysis (Schuller, Jost, Cogswell)
- Pitch Class Set Analysis (Block)
- Schenkerian Analysis (Stewart, Gilbert, Larson)

This thesis utilizes analytical methods from Chord-Scale Theory, Formulaic Analysis, and Motivic Analysis, as my aim is to present information in a form familiar and usable for most improvising jazz musicians. The main research material consists of five published recordings where a synthesizer was deliberately used for improvised melody lines. The primary research method was to imitate, notate, and analyze these solos and to experience the playing situations and challenges of the original performers as accurately as possible, including the exact reproduction of rhythms, notes, chords, nuance, time feel, and synthesizer sound design. I captured my imitations on video clips and included them at the end of each analysis subchapter. The purpose of these videos is to demonstrate the quality of my transcriptions and learning process. “The practitioner’s skills must be subjected to evaluation, to act as context and foundation for research, they must be excellent and professional” (Varto 2018, p. 6). However, the imitation videos are not my artistic statements, and they should not be regarded as such. To include artistic works regarding my studies, I have included links to my latest album, *Looking Back, Reaching Forward*, and selected videos from my doctoral concerts in the appendix. Learning and performing the original compositions and songs frequently performed by the studied musicians in the four doctoral concerts before the

⁶ For example Doctors of Music Markus Ketola, Jarno Kukkonen, Antti Rissanen, Mikko Helevä, Riitta Paakki, Sami Linna, and Tuure Koski.

transcription and analysis of the selected solos has heightened my skills as a jazz artist and given more depth to the theoretical analyses of chapters three and four.

1.3.1 Terminology

This thesis utilizes the concepts of *data*,⁷ *information*,⁸ *knowledge*,⁹ and *insight*¹⁰ in the following manner. Aural imitation of well-chosen improvised jazz solos, together with transcription and analysis, develops both motor skills and cognitive skills (ear-training) and produces masses of data. One piece of *data* (datum) is like a single atom, while organized and analyzed masses of data become *information* in the same way as many organized atoms form matter. In this thesis, information refers to the notated solos and their analyses. The information is immediately accessible on an intellectual level to anyone familiar with the discourse. When information is combined with skills (instrument skill, ear-training skill) and contextualized by an awareness of the jazz tradition, it becomes *knowledge*. A person with knowledge can function as a jazz ensemble member, hear the rhythmic environment, chord changes, and the form, and play along using appropriate and idiomatic jazz language. However, developing such skills requires effort and repetition. In the end, what matters most has less to do with the intellectual complexity of the ideas and more to do with how efficiently an improviser is able to deliver the ideas through the instrument. The simplest idea in the right hands can produce lots of great improvisation. Information alone is insufficient for creating improvisation: even if one can correctly name all the chords and scales on paper, one also needs instrument and ear training skills for instant cooperation of the mind and body. This cooperation can be a more-or-less conscious act to the improviser, but it nevertheless takes place. On the other hand, skills without correct information are not sufficient either. Ultimately, properly matured knowledge and individual artistic vision merge to form *insight*. Building and reinforcing artistic insight is essential to an artist's development. In this thesis, insight means an ability to innovate new artistic output that can reach the future while standing on the previous generation's shoulders and drawing analytical conclusions from other artists' improvisation.

1.3.2 The Relationship Between Composing and Improvising

Many important musicians in jazz history have written original compositions, or at least new melodies to existing harmonic forms (i.e., contrafacts). However, the ability to improvise has always been the most critical factor for determining the level of jazz musicianship: "...while [Jimmy] Raney and many other jazz performers were also

⁷**Data**

As a mass noun.

a. Related items of (chiefly numerical) information considered collectively, typically obtained by scientific work and used for reference, analysis, or calculation.

"data, n.". OED Online. September 2020. Oxford University Press. (Accessed October 04, 2020).

⁸**Information**

Contrasted with *data*: that which is obtained by the processing of data.

"information, n.". OED Online. September 2020. Oxford University Press. (Accessed October 04, 2020).

⁹**Knowledge**

Chiefly with *of*. The fact or condition of having acquired a practical understanding or command of, or competence or skill in, a particular subject, language, etc., esp. through instruction, study, or practice; skill or expertise acquired in a particular subject, etc., through learning. Frequently with indefinite article. Formerly also with †*in* or infinitive.

"knowledge, n.". OED Online. September 2020. Oxford University Press. (Accessed October 04, 2020).

¹⁰**Insight**

a. The fact of penetrating with the eyes of the understanding into the inner character or hidden nature of things; a glimpse or view beneath the surface; the faculty or power of thus seeing.

"insight, n.1". OED Online. September 2020. Oxford University Press. (Accessed October 04, 2020).

composers, it was primarily their improvisation that qualified them to also be recognized as proponents of the jazz art” (Hodges 2009, p. 2). Therefore, it is important to let the studied musicians verbalize their improvising and composing processes. It is exciting to determine if it is possible to find evidence of their conceptions from the transcribed solos.

Decades after the days of Mahavishnu Orchestra, Jan Hammer addressed his relationship with improvisation in a 2020 interview with a Greek online music website, Hit Channel. He emphasized the improvisatory approach as the central method that he has always used in musicmaking. His compositional process often starts from improvisation, and continues by accepting specific improvised passages as a basis for further editing and development (Dimitsoulas 2020.)

Joe Zawinul credited improvisation as his primary tool for making music. “‘It is all improvisation’ he said of his composing style. ‘All my tunes are improvisations. I’m a formal improviser. Even my symphony I improvised’” (Zawinul n.d.a.). Zawinul’s verbal analysis of his music mostly stayed on a general, if not mystical, level. He seldom made use of analytical terms from music theory, and most of his public comments wavered in and out of rugged small talk and opinionated one-liners. However, in the following excerpt from a lengthy interview, Zawinul decided to lift the veil: “Improvisation doesn’t come from the brain—it’s pre-brain” (Prasad 1997). The positive impact of spontaneity on the forward motion and general rhythmic authority of an improvised performance is a phenomenon that is widely acknowledged among the jazz community. I believe it is one of the biggest reasons why performing solo transcriptions publicly is never as rhythmically interesting and impressive as the original improvised performance. There is something magical in not knowing what lies ahead, and Zawinul’s explanation is that improvisation is faster than thought. Later in the interview, he emphasizes the distance between his new musical expression and the bop language he grew up with. As I will demonstrate in my later analysis, his expression on synthesizer still uses many tools in common with the earlier bop language.

In the book *Synthesizer Technique*, George Duke presents his advice on improvisation. Duke juxtaposes composing and improvising as processes. He encourages improvisers to consciously think about motif variation techniques and other compositional tools while improvising. “Your improvisations will work best if you think compositionally. Most solos are built on sequences of little motifs that start with some simple idea, which leads to another simple idea for you to investigate, and that leads you on somewhere else” (Hurtig et al. 1987, p. 90.)

Chick Corea, on the other hand, says the opposite. He shares thoughts somewhat similar to Joe Zawinul’s, but goes further in defining the “empty head” aesthetic in his advisory essay entitled “A Work in Progress...On Being a Musician.” “Playing music combines intention and action into one thing with absolutely no ‘thinking’ at all. All analysis is for the practice room and rehearsal. ... Playing in a performance has to be a ‘pure’ act” (Corea 2002, p. 16). Despite his early classical training, Corea is a jazz musician, so we can assume that the phrase “playing music” includes jazz improvisation. Corea’s opinion excludes any analytic thinking from the actual performance. However, he later stresses the importance of analysis for finding out how things work in the rehearsal stage.

There is footage on YouTube of Michael Brecker giving a saxophone masterclass at the University of North Texas on March 3, 1984. Starting from 25:42, during a question and answer-segment, Brecker touches on how and what he thinks while improvising:

Music for me is largely intuitive. I was talking about it earlier... I am not a real intellectual player. My mind does not work that way. I think fairly quickly. I'm aware of the chords when I am playing... most of the time. I am not really tuned into that. Lately I have been more tuned to shapes and pivot points and melodies. Particularly when I am recording, I've been trying to concentrate on playing a lot melodically and less mechanical... playing looser... and just let... what naturally happens happen... without trying to color it. (Croteau 2023)

Brecker's quote describes simple horizontal thoughts, like the melody's overall arch and pivot points. He immediately emphasizes the intuitive approach, and later mentions the attempt "not to color" the improvisation. Surprisingly, Brecker does not consider himself "a real intellectual player", but he frequently uses tools that contain intervallic symmetry, polyrhythms, and complex patterns that require preliminary rehearsing and advanced music theory knowledge. Although these elements generally qualify as intellectual, my interpretation is that the definition "a real intellectual player" means something else for Brecker. It could be consciously avoiding too much of an analytical mindset or complex theoretical concepts while improvising.

I have always considered composing and improvising to be closely related. In my opinion, the only difference lies in how composing and improvising are related to time. A composer can move freely in compositional time, slow down, stop, rewind, or accelerate the performance and repeat any passage multiple times while trying different variations. A composer can edit, erase, and alter things that happen earlier in the composition and fast forward to hear the possible consequences of these alterations later in the composition. In other words, a composer can be ultimately in charge of the reality of the composition, whereas the linear time of the shared reality binds the improviser. The improviser must accept everything that happens, whether intentionally or unintentionally, in the performance space as a part of the performance. This tether to linear time and shared reality can work as an advantage or a disadvantage for the improviser, as unexpected external (or internal) impulses can provide either great inspiration or great disturbance at any given moment.

Live improvisation is a fundamental part of jazz music. I deliberately did not perform transcriptions of the original solos in the doctoral concerts. Instead, after learning the composed parts of a song, I analyzed the most interesting solos (including other instruments than keyboards) using the aural imitation and assimilation methods described in this thesis. In the concerts, I often improvised based on the recorded solos' overall aesthetics, sound, feel, and improvisatory concepts. Although I aimed at similar language and aesthetics, I wanted to rely solely on my improvising skill. Performing the original solos note-for-note in the doctoral concerts would have seriously compromised the jazz aesthetic of my doctoral work by taking away the thrill and challenge of live improvisation. Imitation is crucial to learning, but there is no point in performing transcribed jazz improvisation (or even variation) for audiences in a concert.

There have been some experiments made where jazz improvisation has been meticulously notated and performed like western classical music. In their 2014 album *Blue*, a New York-based jazz band "Mostly Other People Do the Killing" released a note-for-note remake of Miles Davis' 1959 classic album *Kind of Blue*.

According to an interview of the band leader and bassist Moppa Elliott on the New York Public Radio home page "New Sounds", their main reasons for actualizing a thought experiment like this was to raise philosophical questions such as "What is jazz?" and "How do people listen to music?" From the beginning, they knew what they were trying was impossible. In a way, the minor differences between the two performances highlighted the original

recording. Ideologically, *Kind of Blue* is a jazz album, whereas *Blue* is not, because it contains no original compositions or improvisation. However, both certainly sound like jazz to a person who does not know the processes behind them. (Schaefer 2014.)

Ed Sarath presents a clarifying observation in his article “A New Look at Improvisation”, where he challenges the prevalent notion that improvising would be instantaneous composition, or vice versa, that composing was a slowed-down version of improvising. Sarath provides arguments suggesting significant distinctions in their temporal conception’s directionality. The article utilizes Narmour’s and Meyer’s implication-realization theory, Kramer’s temporal nonlinearity, and Clifton’s phenomenological works. According to Sarath, composers can manipulate the compositional time freely and interact with the past, the present, and the future. At the same time, improvisers can only refer to the unchangeable past in a one-way cumulative fashion, as they must direct most of their awareness toward the present moment (Sarath 1996, pp. 1–31.)

I interpret Sarath’s main point as that complex multi-temporal compositional concepts do not work in jazz improvisation because the demand to communicate and create in the present limits the available resources. Any attempt to divert the focus too much away from the present moment would inevitably interrupt the creation.

1.3.3 Doctoral Concerts

A significant part of my complete artistic doctoral studies was the body of four concerts evaluated by the jury, dedicated to the original compositions and repertoire frequently performed by the studied musicians (for a detailed account of the repertoire, see the Appendix). These songs and transcriptions also made up much of my research material. Each concert was a one-year process that began by listening through the artist’s discography and selecting, transcribing, and learning a purposeful concert repertoire. I wanted to perform material that combined interesting and challenging melodic, harmonic, structural, and rhythmic phenomena with improvisation on synthesizers and signal-processing devices. The target was a 75–90-minute reviewed public concert at the Helsinki Music Center. The concerts were recorded on a multitrack and shot on video for later analysis. All the solos chosen for the aural Imitation–Assimilation–Innovation (IAI) process in chapter three were selected from the concert programs (except “Gossip”, which was rehearsed but cut out at the last moment from the second concert program).

After selection, the songs were transcribed and notated in Avid Sibelius, including parts for other band members. Altogether, I prepared nineteen complete band transcriptions that contained all the composed parts, five lead sheets, and four supplemental transcriptions. Drum parts were simplified to general rhythm notation or excluded, because most of my analysis revolved around melodic-harmonic relations. I relied on published transcriptions only if I was convinced that they were accurate (for example, Chick Corea Elektric Band: “King Cockroach”, and “Got a Match?”). In one case, I obtained the score and parts directly from the composer Jim Beard.

The third phase of the concert material preparation process was temporally the longest. It usually started with designing a live keyboard setup that could provide the same or similar keyboard sounds as the original recordings. I gathered as much information as possible on the original hardware by listening to the sound character and studying the equipment from album liner notes, magazines, interviews, websites, and live videos. I either acquired the same hardware or substituted them with virtual instrument (VI) replicas (for a detailed technical

explanation for each concert, see the following subchapters 1.3.4–1.3.8). When the keyboard setup was built, I transcribed the characteristic synthesizer sounds for each song. Sound transcription means adjusting the synthesizer’s settings by ear to match the synthesizer sound on the recording. It is like police forensics work, where the original case is reverse-engineered from the available evidence. At the same time, I learned and memorized the keyboard parts. For songs that were difficult to memorize or offered motor challenges, I produced backing tracks from the MIDI files I exported from the Sibelius transcriptions. After I had learned to play my parts, I started booking band rehearsals. At first we had a couple of rehearsals in the jazz department classrooms, and later, as we went into more detail, we started rehearsing at my studio space in Helsinki, where all my equipment was permanently set up.

In most cases the band arrangements followed the original recording, except that solos were always improvised. In three cases, my arrangement was different from the original recording. In the following subchapters, I chronologically describe the goals and solutions for each doctoral concert.

1.3.4 Visa Oscar Plays the Electric Fusion Jazz of Chick Corea, 2013

The titles “Nite Sprite” and “Beyond the Seventh Galaxy” highlighted Corea’s 1970s Minimoog improvisation, while the titles “Got A Match?”, “Hopscotch”, and “King Cockroach” focused on the 1980s FM-synthesizer improvisation. The rest of the concert presented Corea’s acoustic piano and electric piano improvisation. The selected repertoire enabled me to focus on Corea’s playing style on four instruments: acoustic piano, Rhodes electric piano, analog monophonic Minimoog synthesizer, and digital polyphonic FM-synthesizer, and experience their similarities and differences.

“Got a Match?” was selected for the IAI process because it is a rare example of tonal language played on a synthesizer in a straight-ahead jazz environment (albeit the syncopated backbeat drum & bass parts and fusion-style overall production). It gave me an excellent opportunity to experience the differences in improvising tonal bop language on a non-touch-reactive monophonic Minimoog and to compare the feeling to imitating Corea’s hard-bop-lines on a touch-reactive polyphonic FM-synthesizer.

I chose the following hardware and software, since they gave me access to the electro-mechanic, analog, and digital keyboard sounds that Corea used in his recordings and live concerts between 1970–and 2000. Rhodes Mark V, Yamaha MOX8 (a budget version of Motif XF 8 with the same sound engine as Motif 8 XF, but fewer features), Minimoog Voyager, and Roland V-synth XT were connected to a Focusrite Saffire 40 FireWire sound card, which also acted as a keyboard line mixer. One master stereo out was sent to the sound engineer at “Front of the House” (FOH), and the same stereo out was also linked into two FBT Jolly-active monitors for keyboard monitoring. An Apple MacBook Pro 17 was running the Apple MainStage AU host platform, which distributed notes, CC, and PC messages to the outboard via USB/MIDI. Focusrite also acted as a sound card for the signal from the computer, summing the output of Apple MainStage into the master stereo out. Each song had a designed MainStage set that contained all the necessary patches needed for a song. Patches (for ex., soft saw pad) were usually layers that included both hardware synthesizers and virtual instruments (VIs). Layering was done to avoid unnecessary processor workload and to ensure a failsafe if the computer crashed. Besides MainStage’s built-in virtual instruments, I utilized several third-party libraries such as Arturia’s V-collection and Native-Instrument’s Komplete 8.

MainStage also provided NI Guitar Rig delay and modulation effects for the Rhodes and Minimoog Voyager. I used a Roland A-800PRO 61 USB controller as a second keyboard and a control surface located on top of the Rhodes Mark V. It is notable that in his new millennia touring setup, Corea himself was also using a rare prototype of a Rhodes Mark V with built-in MIDI, Yamaha Motif 8 XF, and the Minimoog Voyager.

1.3.5 Unleashing the Innovations Behind Michael Brecker's EWI, 2014

The titles "Song for Barry", "Ode to Doo Da Day", "Suspone", and "Original Rays" featured Brecker's EWI-playing/improvisation, while the remaining songs were originally performed on tenor saxophone. The acoustic songs were included because of their interesting improvisational language and personal preference. On "Some Skunk Funk" I decided to play both the trumpet part (originally performed by Randy Brecker) with a breath-controlled trumpet sound and the keyboard parts. Because I had no access to the original hardware Brecker used in the late 1980s and early 1990s before moving into computer-based systems, I replicated Michael Brecker's hardware-based EWI sounds mostly with virtual instruments (VIs). "Gossip" [Live] was chosen because its solo contained several of Brecker's essential EWI sounds and improvisatory concepts.

My virtual instrument system was based on a 2013 Mac Mini running Apple MainStage 3 AU/VST-host (ideologically a later incarnation of the Emagic Logic environment made for live performance by Apple Inc.) on Mac OSX 10.9. Instead of an Akai EWI controller, I used a TEControl USB breath controller and a synthesizer keyboard. My primary sound sources for the breath-controlled sounds were the virtual instruments Apple ES2 and Korg M1le. I purchased EWI sound banks for them from Matt Traum (Patchman Music), who also programmed sounds for Brecker and many others. I usually combine these sounds with some (Logic's multi-sampler) EXS24-breath/flute sounds that I sampled from my Roland D70 and D50 hardware synthesizers. The rotating bass line was created on Arturia's Oberheim SEM V or Yamaha CS-80V plug-ins. Both offer similar possibilities for rotating interval sequences as Brecker's original sound source for the rotator sounds, the Oberheim Matrix 12 (or the Matrix Xpander).

Computers and virtual instruments were also the solution keyboardist/producer George Whitty and Brecker chose in the late 1990s, when sufficient CPU power and RAM became available in compact and somewhat road-worthy packaging. Brecker's first VI system was built into Emagic Logic's virtual MIDI environment in an iMac (Whitty and Dano 2013.)

1.3.7 Joe Zawinul's Improvisational Concept and Its Legacy, 2015

The titles "Directions/Dr. Honoris Causa", "Dream Clock", "Black Market", "Young and Fine", "Palladium", and "Corner Pocket" represented Joe Zawinul's playing style, compositions, and improvisation on Weather Report albums from 1975 to 1980. During this period, the band's sound had already shifted from the merely acoustic avant-garde jazz-rock of the early 1970s into funk, R'n'B, soul, and world music-influenced expression. Zawinul's presence and leadership were greatly heightened compared to the early years when saxophonist Wayne Shorter, acoustic bassist Miroslav Vitous, and Zawinul were equally involved, providing material for the band to play. "Introduction to the Mighty Theme" and "Waraya" were taken from Zawinul's 1996 world music-influenced solo

album *My People*. “Patriots” represented Zawinul Syndicate’s *World Tour* album from 1998. After Weather Report in the 1990s, Zawinul’s compositions and improvisations continued evolving towards world music. “Camieff” (comp. Jim Beard) was chosen to demonstrate how Zawinul’s compositional and improvisatorial aesthetics influenced the next generation of jazz keyboardists. I chose the solo from the 8:30 version of “Black Market” for an extended study, as it contains many essential factors of Joe Zawinul’s late 1970s synthesizer style. Since it is a live recording, it also gives an accurate picture of how Joe Zawinul (keyboards), Wayne Shorter (saxophone), Jaco Pastorius (fretless electric bass), and Peter Erskine (drum set) were improvising together.

I used just one setup to imitate several different Zawinul setups. It was based on my 2015 Helsinki-Cotonou Ensemble (HCE) touring setup with some additions. The heart of it was a Korg Kronos 61 synthesizer placed on the second tier of a three-tier keyboard stand. Kronos served as a sound engine and a controller keyboard (local on). It was connected to my computer through a USB MIDI (two-way connection). A Yamaha MOX8 was on the lowest tier as a weighted action 88 controller (local off) through a USB MIDI for a more authentic tactile feel for piano and electric piano playing. For minimal latency, the piano and Rhodes sounds came from Kronos’ SGX1 and EP-1 engines. A Nord Lead 1 was on the third tier, and it had a DIN MIDI IN connected from the sound card MIDI OUT, only for receiving program changes (PC). I mostly played Nord Lead’s internal sounds locally from its keyboard to avoid latency. Located on the floor to my right was my HCE touring rig 3-unit rack that contained a Focusrite Saffire 40 sound card, USB hub, hard drives, and a power strip.

On a table next to the rack was my Novation Mininova synthesizer/vocoder, also connected via USB MIDI, but I mostly played its sounds via Kronos keyboard. On top of the Mininova, an Apple Mac Book Pro 13’ laptop computer was running Apple MainStage 3 virtual instrument/MIDI-host program that contained all the required patches, effects, and routings. Each patch contained MIDI program changes (PC) for the hardware synthesizers and routing/layering for the hardware and the virtual instruments (AU) that were controlled by MODX8 and Kronos keyboards and controllers (for ex. modulation wheel, pitch bend, sustain pedals, volume pedals, sliders, potentiometers, and buttons). I selected patches by pressing the touch screen of the Kronos (setlist view) that sent master program changes to MainStage. I used Arturia ARP 2600, Prophet 5/VS, and SEM V plugins. Korg Legacy Collection M1 and Wavestation plugins. I had Rhodes Chroma multi-samples in Native Instrument’s Kontakt 5.

1.3.8 The Role of Synthesizer in a Jazz Fusion Ensemble, 2016

Selecting suitable songs for the concert program turned out to be somewhat troublesome. George Duke had a massive catalog of original music published. Still, it was mainly (especially the material after the 1990s) in the soul/gospel/pop domain, featuring smooth vocal melodies and not so much synthesizer improvisation in jazz idiom. Therefore, I selected most of the repertoire from George Duke’s earlier records between the 1970s and the 1980s. I selected songs that, in my opinion, presented the versatility of Duke’s synthesizer playing in the best possible way.

Finding Jan Hammer originals suitable for my objectives was likewise challenging. First, finding originals in the desired jazz fusion domain without being simple riff-based themes took a lot of work. I ended up selecting most of the songs from Mahavishnu Orchestra’s albums. John McLaughlin’s original compositions and Hammer’s insightful synthesizer solos on those albums defined the sound of early jazz fusion keyboards.

I selected Jan Hammer's solo on "Celestial Terrestrial Commuters" for my IAI process because it was a good and compact example of Hammer's early style. According to my research, the maturity of Hammer's concept for synthesizer improvisation in jazz fusion in 1972 was practically unmatched. Most of his peers started playing synthesizer solos on their albums a good year later, and often the synthesizer solos did not utilize the same expressive tools they used in their piano solos until much later. Since "Celestial Terrestrial Commuters" was one of Hammer's first (if not the first) recorded synth solos, he was understandably still in the process of finding his voice on a new instrument. Hammer's career shifted heavily towards film soundtrack production and pop music in the mid-1980s. In his post-1990s output, he seems to have abandoned the chromatic jazz language that he clearly mastered in the burning modal Latin-jazz piano choruses of Elvin Jones' "What's Up, That's it!" (on *Mr. Jones* 1973) or in the soaring Minimoog solos of the Mahavishnu Orchestra.

The instruments that had the most significant presence in the original recordings were Rhodes electric piano and Moog Minimoog synthesizer, both included in my concert setup. I used Rhodes Mark V and Moog Voyager. I had a Korg Kronos 61, Roland A800 controller keyboard, and TEControl Breath & Bite Controller for the other songs connected to my Apple MacBook Pro 15' laptop. The laptop hosted an Apple MainStage 3 VST/AU host program containing all the song titles and their patch changes and additional virtual instruments.

1.4 PREVIOUS RESEARCH

As I have noted earlier, more academic research should be available regarding jazz synthesizer improvisation. I am still looking for previous works that utilized practice-based artistic research on jazz synthesizer solos. Some scholarly works do deal with the studied musicians, but mainly focus on their compositions, life stories, or societal impact. However, these works have provided me with interesting facts regarding their compositional processes that often go hand-in-hand with improvisation. Sometimes, these studies have also presented technical clues regarding the equipment used in the studied solos.

1.4.1 Academic Research

Jan Hammer's compositions for the TV series "Miami Vice" are discussed in Peter Larsen's article (in Danish) "Musik og TV-fiktion. Eller hvad bestiller Jan Hammer egentlig i Miami?" (Larsen 1988). Larsen analyzes three scenes from the series and discusses how Hammer's underscoring contributes to the storytelling. Likewise, Chip Lovitt's article "Jan Hammer: the musical mix-master of Miami Vice" (Lovitt 1986) focuses on analyzing Hammer's compositions for the TV series Miami Vice. Lovitt's article briefly touches on Hammer's life story and former jazz/jazz fusion artist career. As both works focus on Hammer's later career as a composer/music producer for TV series, they are a good read but do not provide any information relating to Hammer's jazz synthesizer improvisation.

Christopher Collins' article "Joe Zawinul" (Collins 2002) is based on a lengthy interview with Zawinul conducted hours before he was awarded the first European Jazz Festivals Organization International Jazz Award. They

discuss various topics and touch on Zawinul's compositional process, which is entirely based on improvisation on multiple keyboards and signal-processing devices. Zawinul reveals that his composing process aims to maintain the spontaneity of the improvisation, the "alpha idea", and has always started from creating an inspiring drum groove. Zawinul also analyses the differences between his and Wayne Shorter's composing styles. Shorter's style was much slower and more analytical than his.

George Duke is often mentioned as an essential sideman in research concerning other musicians. I have yet to find an academic study focusing on Duke and his compositional or improvisational style.

I have not found any academic works that analyze Chick Corea's jazz synthesizer improvisation. Monika Hertzig has analyzed Corea's jazz piano improvisation style and compositions in her article "Chick Corea - A Style Analysis" (which is also available under the name "Monika's Chick Corea Paper") (Hertzig 1999). Daniel Alan Duke's dissertation "The Piano Improvisations of Chick Corea: An Analytical Study" (Duke 1996) analyses five of Corea's solo piano pieces from the album *Piano Improvisations Vol 1*. As Corea's solo piano pieces combine composing and improvisation, Duke applies traditional formal, harmonic, and motivic analysis and reductive techniques related to Schenkerian analysis. Jordan Michael Lynch studies Chick Corea's harmonic language in his master's thesis "Where Have I Known This Before?" An Exploration of Harmony and Voice Leading in The Compositions of Chick Corea" (Lynch 2012). He also analyzes how Corea's oeuvre relates to different jazz music eras.

Michael Brecker's jazz improvisation has been studied and discussed in various ways in several academic works, albeit they focus primarily on the tenor saxophone solos and the improvisational language of Brecker. David Rawlings Freedy's dissertation "Brecker's Blues: Transcription and Theoretical Analysis of Six Selected Improvised Blues Solos by Jazz Saxophonist Michael Brecker" (Freedy 2003) presents a written melodic-harmonic analysis, a conceptualized syllabus of Brecker's improvisational tools including notated examples and complete notated solo transcriptions. Tyler K. Kubler has transcribed and analyzed eight of Brecker's solos over four compositions in his dissertation "The Improvisatory Language of Michael Brecker as Seen through an Analysis and Comparison of Eight Improvised Solos" (Kuebler 2005). He organizes Brecker's improvisational concepts into seven generative categories. His main conclusion is that Brecker utilized these improvisational concepts despite variables in the performance settings, songs, venues, line-up, or tempo.

Academic studies considering Brecker's EWI works are rarities. Mathew Vashlishan aims to introduce and explain the general functionality and performance capabilities of the Akai EWI 4000 in his dissertation "The Akai Electric Wind Instrument (EWI4000s): A technical and expressive method" (Vashlishan 2001). He presents the developmental history of EWI, goes meticulously through its technical functionality, and demonstrates how saxophone playing techniques and articulation can be achieved on EWI. His research material presents transcriptions of EWI solos, including two of Michael Brecker's solos titles, "Pilgrimage" and "In a Sentimental Mood." Vashlishan presents complete solo transcriptions but focuses on introducing new color-coded notation for the EWI that aims to serve the vast performance capabilities of the instrument. No melodic-harmonic analysis or improvisational concepts of Brecker are presented.

Paul F. Berliner's *Thinking in Jazz: The Infinite Art of Improvisation* is a heavyweight in the lineage of jazz improvisation publications. It features a long list of jazz artists who have contributed their knowledge and opinions through interviews and notated musical examples. Stylistically, most examples deal with the bop style; only some

examples of the early jazz, swing, or post-1960s styles are included. The transcription analysis predominantly aims to illustrate different communicative aspects of group interplay. Most of the notated examples are short, and the highlighted phenomenon is often presented without a larger context. The general objectives of the book are so broad that it is impossible to expect a more profound analysis for a single musician or solo.

The electronic musician Nick Wilson has edited a volume of articles into a book entitled *Interpreting the Synthesizer: Meaning Through Sonics* (Wilson 2020). The book examines synthesizers' significance in music and culture from historical, musicological, and theoretical perspectives.

Dr. Kristian Wahlström has used the imitation-assimilation-innovation method in his dissertation (Wahlström 2022). He credits Clark Terry for the concept and points out the similarities between Terry's and Liebman's approach. Wahlström used the three functional phases in studying guitarist Saul "Slash" Hudson's solo on Guns N' Roses' "Sweet Child O' Mine" and extracted idiomatic improvisation vocabulary by analyzing and modifying aurally emulated material. Later, he demonstrates the use of these phases in teaching metal guitar improvisation to a test student as a part of his Student-Centered Musical Expertise (SCME) pedagogical concept.

1.4.2 Books and Magazines

As I mentioned earlier, the most detailed analysis of jazz synthesizer improvisation and synthesizer sounds of the studied musicians are presented in magazines such as "Keyboard", "Downbeat Magazine", and "Sound On Sound".

Jan Hammer's interest in synthesizers is discussed in the article "Jan Hammer the Synthesizer Performer" (White 2004), where Paul White interviews Hammer about his life story and career in music. The article contains many interesting anecdotes and historical facts, but presents no notated examples or melodic-harmonic analysis concerning Hammers' synthesizer style. A more recent interview (Cole 2023) extensively discusses Hammers' personal background, life, professional career, and why he turned to synthesizers in the early 1970s. The article contains many audio examples of Hammer's playing as embedded YouTube links. No music theory analysis or notated examples are presented.

Joe Zawinul's remarkable life story and long career in jazz are well described in Brian Glasser's biography *In a Silent Way: A Portrait of Joe Zawinul*. (Glasser 2001). The definitive history of the Weather Report is covered in detail in Curt Bianchi's book *Elegant People: A History of the Band Weather Report* (Bianchi 2021), where Bianchi goes through every album and tour of the band in chronological order. This book has provided my research with many historical facts, considering Zawinul's relationship with synthesizers and the equipment he used. Drummer Peter Erskine also discusses the history of Weather Report and the personal relations between the band members during his tenure with the band in his autobiographical book *No Beethoven: An Autobiography and Chronicle of Weather Report* (Erskine 2013).

After his untimely passing in August 2013, two separate feature articles were published about George Duke in the September "Keyboard Magazine" issue. A lengthy interview concerning Duke's latest album "Dreamweaver", entitled "George Duke" (Kovarsky 2013, pp. 12-18) contains detailed information about his synthesizer choices, sounds, and solos on the album, as well as a presentation of Duke's 2013 live keyboard setup. A compact

presentation of George Duke's overall keyboard style can be found in Matt Beck's article "5 Ways to Play Like George Duke" (Beck 2013 pp. 28-29). The article compiles some of Duke's most notable stylistic traits with five short, notated examples. A more detailed analysis of pitch bending in Duke's synthesizer style can be found in the June 2019 "Keyboard" article "Soulful Synth Playing" (Kovarsky 2019), where Jerry Kovarsky presents three notated examples of bluesy solos by Duke. The article focuses on different bending techniques and occasionally includes melodic-harmonic analysis.

Pianist Bill Dobbins presents arrangements of Corea's compositions in "The Chick Corea Classics" (Dobbins 1991). Dobbins analyzes the soloists of the accompanying CD release, but not Corea's improvisation. Jerry Kovarsky presents a set of two articles entitled "Celebrating Chick Corea" (Kovarsky Aug. 2021, pp. 32-33) that analyze the synthesizer style of Chick Corea. The first article focuses on Corea's early Minimoog period (roughly 1974-85) and contains three notated examples with analysis. Kovarsky divides Corea's early style into four overarching concepts: 1) clear motivic development & phrasing, 2) pentatonic scales, 3) broad pitch bends, and 4) advanced originality & chromaticism. The second article, "More Love & Respect from Chick Corea" (Kovarsky Sept. 2021, pp. 28-29), focuses predominantly on Corea's post-1985 groups and synthesizer expression. The article presents five notated examples that highlight different song forms, sounds, and approaches by Corea – the text-based analysis remarks on rhythm, scales, intervals, motivic development, and overall solo arch. Monica Herzig's book *Experiencing Chick Corea: A Listener's Companion* (Herzig 2017), as a part of "The Listener's Companion" series, is targeted at a broader, non-professional audience, and aims to explain in an approachable way how to listen, enjoy, and appreciate the works of a particular artist. After the preface, a compact yet thorough bio, and a timeline, Herzig introduces significant works from Corea's vast discography chronologically. Selected tunes are analyzed on a descriptive text level, and occasionally she adds some music theory analysis regarding form, melody, scales, or chords. At the same time, she carries a backstory that adds essential life events and quotes from interviews with Corea and his collaborators.

Bill Milkowski's biography *Ode to a Tenor Titan: The Life and Times and Music of Michael Brecker* (Milkowski 2021) chronologically presents Brecker's life story. The book contains biographical information about Brecker's youth, upbringing, and general life. Still, it mainly focuses on Brecker's significant career events, bands, and the personal relations between Brecker and his collaborators and colleagues. Milkowski dedicates one chapter to Brecker's solo career and the EWI. It deals with Brecker's vision, motivation, and dedication in developing and mastering his EWI system as an ultimate expressive tool for a wind player, but only a few technical facts. In his *Virtual Instrument Magazine* article "Michael Brecker's Logic Pro Environment" (Whitty & Dano 2013), George Whitty explains Michael Brecker's computer-based EWI setup and functionality developed in the Apple Logic Pro virtual environment. As Brecker's computer-based setup was engineered to provide the functionality of the earlier hardware touring setup along with new features, it also describes the functionality of the earlier hardware setups very well.

1.4.3 Instructional Videos and Other Material

George Duke has released an instructional video on DCI, "Keyboard Improvisation" (Duke 1988), where he discusses general concepts such as chord construction, voice leading, and phrasing. When discussing improvisation, he emphasizes motif development techniques and the conception of the underlying song form.

Chick Corea has released two instructional videos on DCI. The first one, entitled “Chick Corea: Keyboard Workshop” (Corea 1987), explains Corea’s practice philosophy and contains music examples with oral commentary for practicing technique, harmony, improvisation, and composition. The accompanying booklet contains notation for the examples and written commentary that summarizes the video's main points. The follow-up is another DCI video entitled “Chick Corea: Electric Workshop” (Corea 1988). The video starts with Corea demonstrating his influences from Paco DeLucia, John Coltrane, and Bud Powell by playing short, uncommented examples. After that, he introduces his keyboard studio and starts recreating step-by-step the compositional process of a tune entitled “Hopscotch.” He takes the viewer through the entire artistic process from the initial improvised songwriting on piano through layering different FM-synthesizer sounds and practicing the various sections with bass and drums until the finished performance with complete form, solos, synthesizer sounds, bass, and drum parts. All three videos were essential to my development as a young player in the 1990s, and they provided me with plenty of information when I reverse-engineered the “Got a Match?” solo sound.

2 SYNTHESIZER HISTORY

2.1 ETERNAL CHAMELEON

One of the most significant features of a synthesizer has been its ability to emulate other instruments. This feature has divided opinions among musicians and audiences since the beginning.

The use of the synthesizer for [acoustic instrument sound] emulation was, as I have said, rejected by many early musicians. Certainly, for those who worked in the experimental tradition or who used the keyboardless Buchla synthesizer, emulation or imitation was seen as missing the point... Many early synthesists like [Walther/Wendy] Carlos strove to produce sounds that were somehow familiar but which were different enough to be interesting. (Pinch and Zittel 2002, p. 116)

As Pinch points out, a synthesizer sound can emulate the characteristics of an acoustic instrument. Remembering that synthesizers were predominately using analog synthesis in the late 1960s and early 1970s is essential. The instrument emulations made on analog synthesizer were not record-like reproductions of acoustic instruments but contained acoustic likenesses to them. A Minimoog flute sound might not fool anybody into perceiving it as the sound of a real flute, but the flute and the Minimoog flute still share similar acoustic qualities. For example, they both consist of a noise transient and a sine wave-like body. Nowadays, the resemblance of a synthetic sound to an acoustic instrument can be anything between astonishingly realistic to pure surrealism. In any case, when playing on a sound that shares acoustic qualities with the flute, one must not approach it from the instrumental tradition of the piano (or keyboards) but like an arranger for the flute. Zawinul verbalized this in his peculiar way in an interview:

*[Joe Zawinul] ...That's why there are very few synthesizer players, which gives the instrument a bad name. Even the good musicians don't know how to play synthesizers; they play it like a f****' piano, which you cannot do. It's another thing: you have to approach its every sound with a different attack, a different feeling of playing, and then perhaps you're playing synthesizer... (Mandel 2007)*

2.2 EARLY DAYS

The first electronic sound creation tools (oscillators and filters) were created individually by and for avant-garde classical music composers who wanted to develop entirely new sonic outcomes. When these sound creation tools were embedded in a single device and the synthesizer as an instrument started taking shape, two dominant design ideologies were born from different needs and aims.

The West Coast ideology was seeded in the San Francisco Tape Music Center in the early 1960s. It can be seen as a direct continuation of the previous avant-garde movement in classical music, an electronic descendant of *musique concrète* and tape music. (Vail 2000, pp. 112–113.) Colin Fleming gives a lively description of the Tape Music Center’s general goals and ethos in his Los Angeles Times book review of *The San Francisco Tape Music Center: 1960s Counterculture and the Avant-Garde*:

The center was to be a place where new approaches to composition were explored, tape loops were built and effects boxes pressed into service in transforming what it meant -- on the West Coast, at least -- to make classical music. Gone were the normal repertory conceits -- string quartet, aria, concerto, movement -- and in their stead came pieces that streamed out through modulators and matrix mixers, with light projections and cinematic backdrops, for a new era of concertgoers. Except that these weren't concerts so much as happenings: festivals of loops, in which jazzers, rockers, students, poets, filmmakers, acid takers, scholars and cultural philosophers came to be wowed and overcome, or at least puzzled. (Fleming 2008)

UC Berkeley physics and music graduate Don Buchla was commissioned in 1963 by composers Morton Subotnick and Ramon Sender to combine the separate voltage-controlled functional modules he had designed earlier into a single device. Buchla’s designs experimented with unconventional control interfaces, like capacitance- or resistance-sensitive touch plates instead of a conventional organ keyboard. The Buchla Electronic Music System (later known as System 100) was delivered to the San Francisco Tape Music Center a year later and became commercially available in 1966 (Vail 2000, pp. 113–114.)

The East Coast ideology was built on totally different premises. In 1963, engineer Robert “Bob” Moog and composer Herbert Deutsch met at the Allstate Conference at the Eastman School in Rochester and started exchanging ideas about the future of electronic instruments. Deutsch invited Moog to his electronic music concert in sculptor Jason Seley’s New York studio in February 1964. After the concert, the two went to dinner and started discussing the possibility of a “small and affordable music synthesizer.” In the fall of 1964, Moog sent the first modular prototype to Deutsch, who wrote a piece called “Jazz Images, a Worksong and Blues”, the first composition ever written for a Moog synthesizer. Deutsch also encouraged Moog, who was hesitating over several options, to include a conventional organ keyboard in his synthesizer design. He said to Moog: “I think a keyboard is a good idea, after all, having a piano did not stop Schoenberg from developing twelve-tone music and putting a keyboard on the synthesizer would certainly make it a more sale-able product” (Luther 2003).

On August 28, 1969, Robert Moog arranged a Moog Synthesizer Concert demonstration to advertise his instruments as part of the “Jazz in the Garden” series in The Museum of Modern Art, New York. Just days before the event, he completed four modular systems (instruments): a simple monophonic bass/lead instrument, a complex monophonic design, a percussion sound unit, and a hybrid design of several Moog modules with a polyphonic keyboard. Each instrument featured a six preset memory for quick access to different timbres. The event aroused a lot of attention, and roughly 4000 people were jammed into MoMA’s Sculpture Garden to see Herbert Deutsch Quartet¹¹ and Chris Swanson Quartet perform electronic jazz-pop-rock orientation compositions (Rosati 2015.)

Critic Bertram Stanleigh praised the performed songs as pleasantly melodic and described the sounds as sometimes reminiscent of well-known acoustic instruments. As to the actual merits of the concert, he mentioned that despite some technical problems, the audience could witness the premiere of a new instrument played by real players (Stanleigh 1969.)

In a sense, the straightforward and practical East Coast approach embodies these (gritty, business-driven) qualities in its aspirations towards efficiency, expediency and reliability. Meanwhile, on the West Coast, Buchla was working amidst a prevalent counterculture bent on experimenting with expanded consciousness and alternative lifestyles. The non-traditional, otherworldly sounds that his machines produced could be seen as an extension and reflection of this culture. (Rivas 2016)

Don Buchla’s later designs preserved the complex modular design, whereas, after the Minimoog Model D’s commercial success, most of Moog’s later designs utilized the more straightforward hard-wired signal chain.

2.3 MINIMOOG HISTORY

Until the commercial release of the Minimoog Model D in 1970, the synthesizer was a novelty instrument – an exotic rarity owned by a few lucky individuals, available only in the most up-to-date electronic music studios. Its sonic capabilities were mostly known among avant-garde circles and electronic music enthusiasts. The modular design, which required connecting patch cables between the functional modules of the synthesizer before any sound was audible, was not accessible to an average musician without engineering skills. Also, the modular synthesizer was not a flexible live instrument for a keyboardist who just wanted to enhance their sonic repertoire with new electronic sounds while taking care of a keyboard player’s basic piano/Rhodes duties. Therefore, the Minimoog’s introduction marked the dawn of a new era.

It was Paul Hemsath, a long-time Moog Music employee, who, during the lunch breaks, put together the prototype of the Minimoog (known as model A) from the spare parts lying around his attic office. Two prototypes (model B and model C) later, the production design was named Minimoog Model D. When assembling his prototype, Hemsath found a keyboard in the Moog office spare part room that used to be a conventional 5-octave (61 C–C key). However, 24 top note key caps had been ripped off to be used as parts elsewhere, leaving only the bottom

¹¹ The Herb Deutsch Quartet with Jim Pirone, Herb Deutsch, Hank Jones and Artie Doolittle.

37 (3 octaves) intact. Hence, he cut the keyboard shorter with a jigsaw to fit the small housing he had built for his prototype Model A (Weiner 2017.)

When looking at the front panel of a Minimoog Model D, the hard-wired signal chain feels straightforward and approachable, especially if you compare it with the earlier modular designs. It has three monophonic voltage-controlled oscillators (VCO), out of which the first two can create a triangle, saw/triangle, reversed saw, square, and two different-width pulse waveforms. The third oscillator has a basic saw instead of a saw/triangle, and it can also be assigned as a low-frequency oscillator (LFO) without key tracking if needed. Also, a separate white/pink noise generator and external audio input are available as sound sources. Oscillators and other sound sources go through a mixer to the voltage-controlled Moog-signature 4-pole low-pass ladder filter (VCF) that offers cutoff, emphasis (resonance), and contour (envelope amount) controls. The last stage is the voltage-controlled amplifier (VCA). Both VCF and VCA have their separate envelopes, with A(attack), D(decay), and S(sustain) potentiometers to shape the sound in proportion to time from a keypress. A separate switch toggles the decay potentiometer to act simultaneously as an R(release). (This somewhat quirky design later developed into a semi-standardized ADSR envelope design adopted by Moog and many other manufacturers, where each envelope stage has a dedicated control slider or potentiometer.) VCO 1 and 2 pitch and VCF cutoff can be modulated with the VCO 3 via the Modulation Wheel. The VCO pitch can be bent m6 interval up or down via the Pitch Bend Wheel. It is located vertically next to the lowest keys of the keyboard, together with the Modulation Wheel. The keyboard of a Model D is a 44-key F-C synth-action key bed.

In the early 1970s, famous progressive rock keyboardists like Keith Emerson, Brian Eno, and Rick Wakeman introduced the Minimoog sound to large audiences. Historically, they were all preceded by Wendy (born Walter) Carlos, who had introduced the sound of his custom-made modular Moog synthesizer to the classical world already in 1968. His album *Switched-On Bach* contained selected Bach works (for ex. Brandenburg Concerto No. 3 in G Major) played part-by-part on an 8-track tape machine. Carlos also helped Moog with technical issues and improvements, such as touch-sensitive keyboard design for the later models (Moogmusic n.d.a.).

Although progressive rock and classical music genres made the synthesizer sound familiar to large audiences, avant-garde jazz musician Sun Ra made one of the first Minimoog recordings (titled “Space Probe and “The Code of Interdependence”) in 1969 (Holmes 2013).

Sun Ra first met Robert Moog after Downbeat journalist and Sun Ra acquaintance Tam Fiofori arranged for a visit to Moog’s factory in Trumansburg in the Fall of 1969. This was most likely October. Bob and his crew were testing prototypes of the Minimoog at that time, inviting Sun Ra to explore its sounds. A recording of this test session was made and, although not originally intended for commercial release, partly released many years later in 1992 as the “Moog Experiment” (My Brother the Wind, Vol. 2, CD tracks 7–11, Evidence Records.) But more significantly, it was during this visit that Moog loaned Sun Ra a prototype Minimoog (Model B), several months before the commercial instrument (Model D) was introduced in March 1970. Ra immediately added the instrument to his repertoire of keyboards, later acquired a second, and featured the Minimoog prominently on many of his recordings of the early 1970s... Ra’s use of the Minimoog in a free jazz context often resulted in long explorations touching on every sound made

possible by the instrument. Listening to Sun Ra play the Minimoog during this period is like experiencing a master class of early synthesizer improvisation technique. (Holmes 2013)

2.4 ARP 2600

Alan Robert Pearlman was a former NASA engineer whose interest in electronics stretched back to his childhood. He became inspired by hearing Wendy Carlos' synthesizer album, *Switched-On Bach*, and started a new company to develop electronic instruments called Tonus Inc. Their first product was a large modular synthesizer called a Series 2000 Modular Studio Synthesizer. It consisted of numerous separate modules that could be configured in countless ways, much like the Moog Modulares. Instead of patch chords, the ARP system used a unique matrix switching panel for signal routing. ARP's pride was its temperature-stable voltage-controlled components, which stood out from the early Moog and Buchla designs that struggled to stay in tune. The series 2000 was later renamed ARP 2500, and was mostly purchased by institutions such as universities and jingle studios. In 1971 they introduced their second model ARP 2600, which was more portable and had a semi-modular architecture. It was designed for musicians and small bands that could not use or afford a large modular synthesizer. It had three VCOs like the Minimoog, one 24 dB/octave filter, one ADSR envelope, one VCA, and a mixer. It also featured a ring modulator, envelope follower, LFO with sample and hold, spring reverb, and internal stereo speakers. The signal routing was "normalised" with sliders, but it also allowed the user to create different routings by overriding the normalization with patch chords. That allowed the creation of very complex routings and sounds, and albeit being far more complex to use than the Minimoog, it soon became a sought-after tool for technology-savvy musicians and sound designers. After its creation, the ARP 2600 was manufactured in three different revisions with slight differences in filter design and panel color layout. After 1975 the monophonic keyboard was replaced with a duophonic-capable keyboard. Around the same time, Tonus Inc. was rebranded as ARP Instruments Inc. An estimated 3000 ARP 2600 units were produced between 1971–1980 (ARP n.d.a; Korg n.d.a; Moog 2000; Vintage Synth Explorer n.d.a.).

2.5 YAMAHA DX7 AND FM-SYNTHESIS

At the beginning of the 1980s the breakthroughs in semiconductor technologies led to new applications and products that would have been impossible to manufacture with earlier technologies. Among them was a frequency-modulation (FM) tone generator. Frequency modulation technology was invented in 1933 by the American engineer Edwin Armstrong to broadcast radio transmissions with higher fidelity than amplitude modulation (AM) radio. In FM radio, one signal, the modulator, modulates another signal, the carrier. The carrier is a radio frequency that is not audible but "carries" the modulator, i.e., the desired program to be broadcast. The FM synthesis was developed in the 1960s at Stanford University by a Pioneer in computer music, John M. Chowning, who sought an alternative to analog synthesis. Yamaha licensed the FM synthesis technology exclusively in 1973. After years of development, the first FM tone generator product, the GS-1 synthesizer, was released in 1980. In 1983, the 61-key six-operator

portable synthesizer Yamaha DX7 was released three years and several prototypes later. The main building block of FM synthesis is an operator, which can be considered a rough equivalent to an analog synthesis oscillator. The DX7 has six operators, each consisting of a digital oscillator producing only a sine wave, an amplifier, and an envelope. A single operator can be used as a carrier or a modulator, and both are audible in the resulting sound. The frequency of the carrier determines the audible pitch. The modulator's frequency determines the waveform's shape, which creates the timbre of the sound. When the operator functions as a carrier, its envelope functions as a volume envelope; when it functions as a modulator, its envelope determines the timbral variation over time (a bit like a filter envelope in analog synthesis). Operators can be joined together in series or parallel. The combinations of these operators in the DX7 and following Yamaha products are called algorithms. The DX7 has 32 factory-made algorithms, which are pictured as diagrams on the instrument's front panel. The original DX7 was manufactured between 1983 and 1989 and is still among the world's best-selling synthesizers. It resulted in several sibling models and spinoffs utilizing similar FM synthesis engines. Among them was the TX816 rack model Chick Corea used for "Got A Match?", which combined eight DX7 sound engines into a single chassis. Even today, FM-synthesis is at the heart of Yamaha's synthesizer production line (Yamaha Montage), along with other synthesis methods (Yamaha n.d.a; Yamaha Corporation n.d.a; Mattis 2001; Roberts 2001.)

2.6 ELECTRONIC WIND INSTRUMENT (EWI)

EWI and EVI are electronic instruments developed by the American musician and inventor Nyle Steiner in the early 1970s. Their primary purpose was to give woodwind (Electric Wind Instrument, EWI) and brass players (Electric Valve Instrument, EVI) the ability to control synthesizers with a familiar user interface. The first hand-made EVI model went on sale in mid-1970 by the Steiner-Parker company. Steiner-Parker broke up in 1979, but Steiner soon found a new partner in the Italian company Crumar, which took EVIs into mass production in the early 1980s. During the mid-1980s, Steiner continued limited production of handmade EVI (and EWI) "Steinerphone" models for top professionals. Around this time, Michael Brecker ordered his first Steinerphone with an EWI interface. Brecker quickly featured his Steinerphone on several recordings (for example, Steps Ahead Live in Tokyo 1986). In 1987 Japanese Akai began mass production of the EWI (and EVI) 1000 model based on the Steinerphone design. That began a long engineering relationship between Nyle Steiner and Akai that has continued ever since. During his career, Michael Brecker played with several EWI models, either hand-made by Steiner or factory-made by Akai. The EWI system consists of the wind controller and the synthesizer. The wind controller has a silicone mouthpiece with sensors for air pressure (usually for volume control) and bite (usually for vibrato). The buttons can be configured to mimic the logic and fingerings of several standard woodwind instruments, but they are stationary touch sensors. The EWI's playable range is 7 octaves. A set of metal plates and rollers is implemented on the backside for octave shifting, pitch-bending, and glide effects. When playing, the data created by the sensors and buttons are routed to several synthesizer parameters, giving the player extensive real-time control over important synthesizer parameters such as volume, filter cutoff, and amplitude envelope. In later EWI models, a MIDI (Musical Instrument Digital Interface) out port was added, through which one could send the control data to any MIDI-equipped synthesizer (Akai Professional n.d.a; Traum 2023.)

3 ANALYSES

Chapter three presents five solo transcriptions and focuses on music theory analysis.

- 1) "Celestial Terrestrial Commuters" (Composer, John McLaughlin, Synthesizer solo by Jan Hammer, 1972)
- 2) "Black Market" [8:30] (Composer, Joe Zawinul, Synthesizer solo by Joe Zawinul, 1977)
- 3) "Brazilian Sugar" (Composer, George Duke, Synthesizer solo by George Duke, 1979)
- 4) "Got a Match?" (Composer, Chick Corea, Synthesizer solo by Chick Corea, 1986)
- 5) "Gossip" [Live] (Composer, Mike Stern, EWI-synthesizer solo by Michael Brecker, 1989)

These solos trace a seventeen-year path (1972–89) into the history of jazz synthesizer improvisation. They reflect the expressive possibilities of the synthesizer at the time of the recording and the studied musicians' artistic choices. I studied these solos using traditional self-learning methods for jazz musicians, as described in Clark Terry's Imitation–Assimilation–Innovation concept and David Liebman's "Complete Transcription Process". Video footage of me imitating the solo is included as a YouTube link after each analysis chapter.

Information regarding the analysis practices

- The markings for the melodic-harmonic analysis are inside the notated examples and the verbal analysis is written below each system with corresponding bar numbers.
- References to individual pitches are following "International pitch notation". For example, the middle c of the piano (MIDI note number 60) is marked as C4.
- References to scales are marked with a capitalized root and the name of the scale—for example, C-minor pentatonic or D-Dorian.
- References to chord symbols are written with capitalized roots and the chord's quality, as in the *Legal Real Book*—for example, Cm7 or D13b9.
- In functional analysis, the Roman numerals are written with the European jazz standard (as thought in Sibelius Academy jazz department) where all numbers are capitalized, and the full chord qualities are marked: for example, Im, V7, IIm7b5 add 11. The root numerals and their accidentals always follow the major scale.

The notated examples aim to present several things simultaneously.

- I have meticulously transcribed the rhythms, notes, and chord symbols to accurately describe the musical content of the original recordings.
- The standard chord symbols present the basic chord changes of the composition as in a lead sheet.

- The additional chord symbols in square brackets represent the chord changes the soloist underlines in the improvised melody line instead of the basic chord changes. In some cases, there might be several juxtaposed chords in square brackets presenting the suggested changes for individual players. Without a chord symbol in square brackets, the lines and comping are analyzed following the basic chord changes.
- The small numbers above the melody line present melody analysis based on the chord tone and non-chord tone terminology common to jazz education (see Terminology). The melody analysis is based on the chords I believe the soloist is thinking/hearing internally. These chords are marked in brackets.
- Horizontal brackets contain additional analysis of scales or chord arpeggios.
- Boxes around an individual or a group of notes describe a specified phenomenon, such as an enclosure with start and end notes. These boxes are always explained in the attached text.

I have categorized the jazz expression found in the analyzed solos into three categories: tonal¹², modal¹³ and chromatic¹⁴ jazz language.

3.1 “CELESTIAL TERRESTRIAL COMMUTERS” (JAN HAMMER)

3.1.1 Background

Roughly two years after the Minimoog product launch, in August 1972, Jan Hammer was in the studio with the Mahavishnu Orchestra recording their second studio album, *Birds of Fire*. On the song “Celestial Terrestrial Commuters”, he played a burning one-chorus solo on a Minimoog instead of a ring-modulated Rhodes that he frequently used on previous tours. In a “Sound On Sound” interview over three decades later, Hammer reflected on his transition from (electric) piano to synthesizer. He also suggested that the famous synthesizer recordings of the late 1960s still did not use the full expressive potential of the synthesizer as a solo instrument.

[Jan Hammer] “It was an ongoing process where the piano was eventually not enough. The piano is a great instrument, like an orchestra at your fingertips, but I was hearing things with more fluidity and more movement. I wanted the tonal quality of bending notes and adding vibrato and all that. I heard things that were more expressive in that sense – and you just couldn’t do it with a fixed pitched instrument. So, I played electric piano, organ and eventually the synthesizer. I got hold of one of the first ring modulators that allowed me to bend the sound of the electric piano in such a way that it hinted at some sort of movement, but at the same time I was hearing synthesizers on albums such as Switched-on

¹² In this thesis the tonal jazz language refers to improvised melodies that reflect chord changes by connecting the chord tones on beats with passing notes on the upbeats. This style was invented in the early 1940s by alto saxophone player Charlie Parker and refined by numerous jazz players of the bebop and hard bop eras (roughly from the 1940s to 1960). It is still the most known and used concept for improvising tonal melodies.

¹³ In this thesis the modal jazz language refers to improvised melodies that abandon the rhythmic structure and the chordal reference of the tonal line and treat scales like color palettes that can be contrasted against each other. In the early form one scale usually reflected one chord or vice versa. This style was developed by players like Miles Davis and John Coltrane in the early 1960s.

¹⁴ In this thesis chromatic jazz language refers to improvised melodies that create dissonance by utilizing the innovations of the modal jazz language but side-slipping, or superimposing the modes and melodic cells further from the tonal center. This playing style was developed by players like John Coltrane and McCoy Tyner in the mid 1960s.

Bach. Even then, the synthesizer was being used more as an orchestral instrument rather than as a solo instrument, and even where glide was being used, it wasn't being used expressively like playing a violin or even a voice. When I first laid my hands on a Minimoog with its pitch-bend wheel, it was truly a Eureka moment – I thought 'Wow, this is it! This is what I'm looking for.' (White 2004)

3.1.2 “Binky’s Beam”

Celestial Terrestrial Commuters is a faster remake of an older McLaughlin composition, “Binky’s Beam” [from his 1969 solo record *Extrapolation*], and therefore the Mahavishnu band members knew the tune as “Binky’s” (Kolosky 2010). “Binky’s Beam” is a slow blues in the key of E. It was recorded on 18 January 1969 at Advision Studios in London with an all-British line-up. Besides the main melody, one of its most recognizable features is a comping riff, or ostinato in 19/8 meter (divided 3/4+3/4+7/8), that keeps the form together. It is predominantly based on an idiomatic blues riff in the Mixolydian mode. McLaughlin might have gotten the rhythmic shape of the ostinato from a North Indian traditional rhythm, “Sunand Taal 9,5”, with similar rhythmic divisions. In the intro, the guitar and the bass play the riff, but during the head and the solos, the acoustic bass plays it alone with moderate variation. The two-bar main motif starts as a one-bar pickup to the first downbeat of the form. The form is extended during the head, but the solos follow a 10-bar blues form.

3.1.2 AUDIO 1 McLaughlin, John. “Binky’s Beam” audio & score

<https://youtu.be/eJyhQHswUEo>

3.1.3 “Celestial Terrestrial Commuters”

Compared to “Binky’s Beam”, “Celestial Terrestrial Commuters” is faster and more intense. It is transposed a minor third up to the key of G-major and contains a very similar 19/8 ostinato figure (3/4+3/4+7/8) that utilizes a somewhat sharper Lydian dominant (Overtone) scale. The basic form is eleven bars. At the beginning of the form, there are three bars of I7 instead of two. Instead of going to the IV7 chord (common in blues forms) on the 5th bar, it goes up a whole tone to A7 (II7) for bars 4–5. During the head, bar 7 is 18/8, while others are 19/8. The same form is used in the solos, but the 18/8 bar is changed to 19/8. The turnaround in bars 8–11 is entirely newly composed material. The main melodic motif is the same as in “Binky’s Beam”, but its placement differs. In this case, the motif starts on the first upbeat following the downbeat of the form. “Celestial Terrestrial Commuters” also has new thematic material after the solos and coda. Nevertheless, there is a strong likeness that ties these two songs together.

3.1.3 Audio 1 Mahavishnu Orchestra. “Celestial Terrestrial Commuters” (theme)

<https://youtu.be/I6Dpp2XudkA>

3.1.4 Synthesizer Solo Sound

Jan Hammer built his solo sound on a sawtooth waveform and routed OSC 3 in control mode to modulate the filter cutoff with a ratio that almost reaches audio frequencies, giving the solo sound its “buzzing” sound. It is a form of simple FM synthesis made on an analog synthesizer. In a “Sound On Sound” interview, Hammer described how he aimed for added “bite” and guitar-like character with enough sonic energy to be heard.

I did all kinds of things, including playing the synth through a distorted guitar amplifier...Whatever I use, I'm going for the same end result – an exciting rock & roll-like sound. It really started in the Mahavishnu Orchestra when I was

looking for something to cut through that incredibly busy sound that we were creating. I had to have a sound that would project, so I used guitar amps and that's when the sound got really exciting. (White 2004)

However, on this recording, Jan Hammer's solo sound is more likely captured directly from the Minimoog outputs to maintain its dominant high-end energy.

3.1.5 Jan Hammer's Indian Influence

McLaughlin had also, via a cassette tape, introduced Jan Hammer to the music of the great Indian veena master Balachander. Hammer marveled at how Balachander bent the strings of his ancient instrument. Hammer became heavily influenced by him in his approach to playing the Minimoog synthesizer, making The Mahavishnu Orchestra sound even more Indian. (Kolosky 2010)

3.1.5 Audio 1 Balachander, Sundaram. "Ragam Thanam Pallavi – Sri – 2 Kalai Adi, Pt. 2" *In Concert-Live*"

<https://youtu.be/z0-6yO2Ogng>

Sundaram Balachander (18 January 1927–13 April 1990) was a South-Indian multi-instrumentalist and filmmaker. He was exceptionally talented on a long-necked, pear-shaped lute called veena, on which he was primarily self-taught but was still considered a founder of a new school of veena playing. He mainly performed South Indian Carnatic music (Hunt 2024.)

It is impossible to measure the exact amount of Balachander's influence on Hammer's playing. However, it is astonishing how similar the scale, nuancing, and timbral qualities of examples 3.1.5 Audio 1 and 3.1.5 Audio 2 are.

3.1.5 Audio 2 Mahavishnu Orchestra "Celestial Terrestrial Commuters" *Birds of Fire* (synthesizer solo by Jan Hammer)

<https://youtu.be/MHhaMwr8KQg>

Coincidental or not, in 3.1.5 Audio 1, you can hear Balachander using the same scale (on the recording Bb-minor pentatonic over Eb) that Hammer uses in 3.1.5 Audio 2. On the other hand, numerous jazz solos recorded in the late 1960s utilize the same scale, so it is also possible that Hammer's influence comes from jazz recordings. Unfortunately, Kolosky's writings do not reveal the cassette tape's exact contents or origin. Was it a commercial release, or did John McLaughlin make a bootleg recording of Balachander? These important questions must be answered before any further conclusions can be drawn considering Balachander's actual influence on Hammer's synthesizer improvisation.

3.1.6 Western Roots of the String-like Playing Style

A synthesizer player can approach ensemble playing from different angles depending on their background as a player and the equipment and aesthetics they choose to go with. After the rise of rock music (not to be confused with its predecessor, rock 'n' roll) in the mid-1960s, the sound of the electric guitar through effect pedals and amplifiers became the voice of the young and hip generation. Rock also quickly became an ideology representing originality and integrity to its followers. Rock and pop music were often juxtaposed as polar opposites, because pop was considered to be driven entirely by commercial values and mass production. Since the sonic paradigm of rock was so heavily based on the electric guitar, many keyboard players with a rock background started emulating guitar-like sounds and playing styles on the synthesizer. This approach became a significant part of Jan Hammer's expression, although Hammer began his career as a hard-bop piano player. Perhaps it was the collaboration with John McLaughlin and Hammer's two-year tenure in the different incarnations of Mahavishnu that paved the way for Hammer's string-like synthesizer solo concept. During his first years as a synthesizer improviser, he also experimented with other domains, such as two post-bop/free jazz Elvin Jones's records, *The Prime Element* (1973) and *Elvin Jones is "On the Mountain"* (1975). On these records Hammer is using chromatic jazz language on top of "time no changes" with more jazz aesthetic – closer to the way he used to improvise on piano a few years earlier. After

starting his solo career as a synthesizer player around 1975, Hammer collaborated with electric guitar heroes like Jeff Beck, Al Di Meola, Neal Schon, Jimmy Page, Eric Clapton, and Steve Lukather.

3.1.7 Solo Transcription

Since the trademark ostinato figure is not played until the last two bars of Hammer's solo chorus, the most dominant rhythmic division comes from the drummer Billy Cobham, who divides one 19/8 measure in groups of 4/2 and 3/8 beats. In practice, he plays a 4/4 funk beat in half-time feel and adds 3/16 (16/16+3/16=19/16) to each bar. However, the bass player Rick Laird follows the ostinato's division (2x 3/4 + 7/8) as a contrast in his simplified bass line. For the most part, Hammer seems to follow the drum beat division in his solo.

Celestial Terrestrial Commuters

Minimoog synthesizer solo by: Jan Hammer

♩ = 432 Half-Time Feel Funk John McLaughlin

Minimoog [Dm7] motif a 5/8 motif b 7/8 motif a 5/8 motif b 7/8
 D minor pentatonic pre bend

Bass Guitar G7
 3/4 3/4 7/8

Bars 1-2

In bar 1, the line consists of two rhythm motifs, 5/8 and 7/8. In bar 2, the 5/8 motif is repeated but displaced one-quarter note earlier. The scale is D-minor pentatonic, a common choice in the modal language for a dominant chord rooted pure fifth down (D-minor pentatonic over a G7). It creates a "9sus"-sound because the major third and the major sixth of the closest Mixolydian mode are omitted.

Moog [G] [Dm7] [A] [Em7]
 3 1 b3 1 app. 3 3 3 3 3 3 4:3
 m3 bend D minor pentatonic E minor pentatonic

Bass A7

Bars 3-4

Bar 3 starts with a bend that introduces a b3 of the key (Bb3). This also underlines the chord's root (G3) and is therefore labeled with tonal analysis numbers. Hammer continues by playing the D-minor pentatonic in a modal way again. In bar 4, he again places the tonally significant major third of A7 (with a bend from below) on the downbeat of the chord change. This secures both the new chord and the downbeat firmly. He plays triplets in E-minor pentatonic on top of A7 and places a quadruplet against the last 3/8.

Bars 5-6

Bar 5 stays in E-minor pentatonic and contain

s a repeating a 3/8 cell (motif c) before introducing the motif b' as in bar 1 but transposed a whole tone up and replacing the last note of the phrase with a major third (C#4) of A7 that leads to the major third (B3) of the G7 chord again on the next downbeat. Bar 6 starts with an upward G-triad arpeggio that underlines the chord before moving to the G9sus4 sound of D-minor pentatonic again.

Bars 7-8

Bar 7 repeats the 3/8 motif c two times transposed in D-minor pentatonic. Bar 8 resolves again on the major third of the Dbmaj9 on downbeat and continues as an Ab-major pentatonic scale run in triplets, forming an open-ended question. Major pentatonic a fifth above the root is a common scale choice in modal/chromatic jazz language for a tonic major chord, and it was also utilized in South-Indian veena improvisation by Balachander (see 3.1.5 Audio 1).

Moog *q* [Abm6]
 Ab jazz minor 2nd mode
 chromatic
 Bass Abm⁶/Bb G⁷

Bars 9-10

Bar 9 contains this solo's most dissonant scale choice: the 2nd mode of Ab jazz minor, which creates a Bb7sus9 (marked Abm6/Bb) sound. It is the high-tension point of the solo arch roughly $\frac{2}{3}$ from the beginning (very close to the golden ratio). The downward line completes the previous upward run like an answer. Bar 10 introduces chromatic dissonance: The guitar enters with the main riff that outlines the overtone scale (#4 and b7), but the solo line still uses pitches C (4), C# (#4), and D (5) for two 3/4 phrases before compressing to a 2/4 and a 3/8 cell.

Moog || G Mixolydian
 m⁵ bend
 to guitar & violin solo
 Bass G Mixolydian

Bars 11-12

Bar 11 continues repeating pitches C and C#, but this time in a 2/4 cell. The rest of the bar is in G Mixolydian. Bar 12 ends the solo with a minor 3rd bend in the higher register like a last cry before the guitar and the violin take over.

3.1.8 Summary

The main point of this solo is the rhythmic authority that binds the unusual meter tightly together. Other notable features are Hammer's idiomatic phrasing and systematic development of string-like motifs. Melodic-harmonic content is typical for the early jazz-rock era: predominantly one scale per chord except for a more dissonant chromatic motif at the end.

3.1.9 Audio & Video Examples

3.1.9 Audio 1 Mahavishnu Orchestra. "Celestial Terrestrial Commuters" (Minimoog solo by Jan Hammer)

<https://youtu.be/MHhaMwr8KQg>

3.1.9 Video 1 Oscar, Visa. "Celestial Terrestrial Commuters" (Jan Hammer's Minimoog solo imitation)

<https://youtu.be/AkwBR2TGsHM>

3.2 “BLACK MARKET” [8:30 LIVE] (JOE ZAWINUL)

3.2.1 Joe Zawinul’s Early Style

Joe Zawinul’s artistic expression started changing in the mid-1960s when he moved from acoustic piano to electro-mechanic keyboard instruments (Wurlitzer and Rhodes electric pianos), and later to the various synthesizers that became his main instruments for improvising in the mid-1970s. During his (1959–61) tenure with the singer Dinah Washington (1961–69) and with the hard-bop alto saxophonist Julian “Cannonball” Adderley, he mainly played acoustic piano. In this period, his solos and comping followed the pure hard-bop idiom, tinted with traces of gospel. As Cannonball’s band’s artistic style changed towards R’n’B and soul after the mid-1960s, Zawinul replaced the piano with the electric piano, while his playing became even more blues & gospel oriented.

When listening to the available recordings from the five years 1966–1971, one can notice that the change in Zawinul’s language from tonal hard-bop to the unique modal pentatonic language happened quite consciously. On the record *The Rise and Fall of the Third Stream* (Vortex Records, 1968, compositions by William Fischer and Friedrich Gulda) one can hear Zawinul already searching for a new language on piano by utilizing both modal jazz and classical post-romantic piano vocabulary in his comping and solos.

Based on my conversations with Jim Beard, who had several possibilities to discuss the matter with Zawinul personally, I suspect that in Zawinul’s case the reasons for his complete improvisation style makeover and shift to synthesizer somewhere between 1973–74 lie more in the sonic features of the synthesizer than in the jazz community’s general zeitgeist. Zawinul did not use the idiomatic tonal language in his synthesizer solos at all in the way he used it on piano a decade earlier. Other musicians (such as Chick Corea, Michael Brecker, and Pat Metheny) with a background in acoustic hard-bop have utilized more idiomatic elements of the tonal language in their synthesizer solos throughout their careers.

3.2.2 Weather Report Group Playing Concept

By the time of the live album *8:30* release, Weather Report’s paradigm of jazz improvisation had shifted from the hard-bop aesthetics of “theme and solos” toward conversational improvisation equally influenced by gospel, jazz, R’n’B, funk, and world music. Zawinul referred to the group’s improvisatory concept with a quirky one-liner: “everyone solos and no-one solos” (Mandel 2007). Even using the word “solo” (Italian for alone) when describing Weather Report’s playing feels a bit ambiguous. Especially since the present-day paradigm of an improvised jazz solo is still mostly inherited from the hard-bop era, where it certainly meant more of a monologue with a merely supporting role and limited interaction from the accompanying players. One could argue that collaborative improvisation already blossomed in the early jazz era among the players of New Orleans-style brass bands. However, those influences are no longer a part of mainstream jazz language. Indeed, the Weather Report’s way of improvising could be defined as “conversational”, analogous to a group of people conversing freely on a mutual topic. Someone might lead the discussion at a given moment, but others are always involved and presenting counter-arguments. Even the song form might give in when someone gets carried away for a moment. However important this conversational aspect is for Weather Report, one must not expect to find the apparent exchange of melodic phrases or

direct imitations of rhythms. I would instead use Benjamin Givan's three-pronged definition of jazz improvisation interaction (Givan 2016) and say that most of the conversations found in "Black Market" consist of either "micro interaction" or "macro interaction." There is very little "obvious motivic interaction" to be found, and it certainly was not favored by the band leaders either. Drummer Peter Erskine remembers the following story from the studio while listening to the 8:30 live recording tapes. Zawinul gave his unapologetic opinion about the short "Mickey mousing" motivic interaction during the saxophone and drums duet that precedes the second solo vamp (or Zawinul's solo).

Then, just at that moment, Wayne did this whole sequential ascending pattern thing, and I caught it. Zawinul hears that on the tape, turns to me with a really sour look, and says, "Uhm! Too bad you had to do that."... "I began to understand that the role of the rhythm section is not to play in unison, but to provide the constant as well as the contrast, or counterpoint." (Erskine 2013)

Several people (for example, Cuscuna and Belden 2001) have suggested that the famous studio sessions Joe Zawinul played for Miles Davis in 1969 also played a significant role in developing Weather Report's group playing concept. From the late 1969 album *Bitches Brew* on, Miles Davis started playing more R'n'B, gospel, and funk-oriented grooves and long static vamps, over which the soloists were invited to improvise freely. Zawinul played electric piano and organ in these recording sessions that were later released on several albums and contributed nine original compositions – for example, "Pharaoh's Dance" and "In a Silent Way." These recordings are often considered to be the starting point of the jazz-rock and jazz fusion genres.

3.2.3 Zawinul Changes to Synthesizer

"The EMS Putney was my first synthesizer," Zawinul commented. "I bought one together with a friend of mine who lived in the same building in New York. Putney only had one oscillator. It was like a wooden board with a bunch of little holes in it where you put these toothpicks with wires, and you could create one oscillation. It created little radio-type sounds." (Tingen 2003)

Although Zawinul recalls that his first own synthesizer was a single oscillator semi-modular analog EMS VCS3 "Putney" model, the ARP company states in their advertising that Zawinul has used the ARP 2600 since 1971 (see ad).¹⁵ According to Mark Vail, the ARP representative Roger Powell was demoing and pitching the ARP 2600 in 1971 around the United States and the two crossed paths in Boston where Zawinul was performing at the Jazz Workshop. Powell gave Zawinul an introduction to the ARP 2600, and after some time Zawinul agreed to take an ARP 2600 home for further experimenting (Vail 2000.) However, Zawinul still took several years to incorporate the synthesizer into his playing and improvisation. There is a slight contradiction in the timeline between Zawinul's quote and ARP's advertising. If the EMS model he recalls as his first synthesizer was one of the earliest wooden

¹⁵ <https://g.co/arts/v96a6E24xBCqRiDp8>

housing “Putney” models manufactured since 1969, the ARP advertising statement could be true. However, the earliest EMS “Putney” model was a three-oscillator design. If Zawinul refers to a later EMS Synth, AKS model manufactured in 1972, which was a single oscillator design built in a plastic suitcase, then ARP’s timeline could be slightly optimistic, or some of the details are incorrect. Unlike Corea, Hammer, and Duke, Zawinul never used the popular Minimoog for his solos. In an interview, Zawinul explained his relationship with the rival East-Coast synthesizer companies.

I like the Arp because of what I can do with it. I hear the Moog, it’s immediately the Moog. With the Arp I can do things that will fool the heck out of you. I can hide between voices, I can do all kinds of things. To me it’s a much more natural sound. The variety of colors is greater, too. Woodwind sounds... if you have the right hearing, you can really get it. But it takes time and work--like if you’ve got the coordination of a fighter, getting those combinations together--it’s the same here, you get your moves together so that you can perform with it. (Bianchi 2005)

The ARP 2600 was used for the first time on Weather Report’s second studio album *I Sing the Body Electric* (1972) for sound effects (programmed and played by the ARP representative Roger Powell), and on several songs on the 1973 album *Sweetnighter*, predominantly for arranged melodic passages and short fills. Based on my analysis of available live recordings, Zawinul shifted his improvisational focus from the effected electric piano to synthesizers gradually and a bit later, somewhere between 1973–and 74. For the first live solos he used the ARP 2600 exclusively. His phrasing became a straighter eight/sixteenth feel. His scale choices were often pentatonic (especially mixing the notes of root minor/major pentatonic rapidly). The “everyone solos and no-one solos” approach made his improvisational lines even more sparse than those he had played during his hard-bop years. He often aimed for rhythmic and melodic counterpoint between different keyboards and with the other band members. His comping harmonies were usually based on diatonic triads/fourths of pentatonic scales that resemble the underlying harmony. Although Zawinul changed his improvisational language during the 1970s entirely from the tonal language of hard-bop to modal-chromatic, he did not follow the modal/chromatic roadmap laid by John Coltrane and McCoy Tyner but developed a unique style. He merged the modal jazz sound with the Austrian folk music he had played on the accordion in his adolescence.

[Joe Zawinul] We were doing modal stuff in Vienna, you know? We were getting into all these different scales from folk music. (Cerra 2017)

Zawinul’s language in the “Black Market” solo contains modal elements in the form of a “common denominator scale”, a bank of common notes (often a pentatonic scale) that persist over several chord changes. He stays on a single pentatonic scale so long that it gives the whole solo an indigenous or naïve melodic character. His melodies very rarely contain the swung 8th notes, syncopation, and offbeat changes of melodic direction familiar to the tonal jazz language melodies. Instead, he prefers singable ethnic-sounding motifs and occasional double-time bursts of evenly phrased notes. Sometimes, Zawinul introduces jumping lines with larger intervals. Gestures familiar from

his earlier hard-bop piano style, such as blues phrases or double stops, disappeared. His synthesizer solo lines are monophonic (due to the technical limitations of a monophonic synthesizer), and their acoustic reference seems to be some ethnic wind instrument rather than any conventional jazz instrument. Yet he states in an ARP advertisement that he can make his ARP 2600 sound like John Coltrane. I assume that his reference to Coltrane is merely comparing sound characters or energy levels (or out of respect) since, from a theoretical or aesthetic viewpoint, Zawinul's lines clearly differ from Coltrane's. It is still possible that, albeit with apparent differences, Zawinul's improvised synthesizer lines are his subjective take on Coltrane. The following quote demonstrates Zawinul's fascination with the sound emulation capabilities of synthesizers, even though the "realism beyond imitation" obtainable with analog synthesizers was later greatly surpassed by other synthesis methods.

I want orchestral sounds from a synthesizer, the kind of realism beyond imitation. I can make the 2600 sound like Coltrane, just like Coltrane...or change it to soft, haunting flutes. My first 2600, 'Eins,' is my soft synthesizer, with a clear, clean sound I have never heard on any other. 'Zwei,' my second 2600, gives me a harder edge, so they are complementary. (Bianchi 2005)

Although Zawinul's later career with the Zawinul Syndicate leaned heavily on world music, his approach to improvising and music-making remained in the jazz domain. This mainly concerns his rhythmic choices, poly-rhythms, nuances, time manipulation, and, most importantly, his ability to listen and collaboratively improvise with the other players regardless of their musical inheritance. These qualities still connected him to the jazz tradition, which is how he characterized himself in a 1996 "Wire Magazine" interview.

"That's why I can play with the Africans as a natural thing. I mean, I'm not trying to play African music, I don't really know anything about it, or South American music, or Turkish or Indian. It's just a feeling I got—for people. I can go to Israel and play their music, to the Arabs and play their music. I just know how to do that." (Mandel 2007)

3.2.4 Joe Zawinul's 1978 Keyboard Setup

Joe Zawinul played the "Black Market" theme on the 8:30 recording with an ARP 2600 semi-modular monophonic analog synthesizer. By the time of the recording, his stage setup featured two ARP 2600 synthesizer units stacked on top of each other: an ARP 2600P (gray-white paint) that was called "Eins" and an ARP 2601 V 3.0 (black-orange paint) called "Zwei" (Bianchi 2005). For the main theme, he used a lead sound with inverted keyboard control voltage. That made the leftmost key of the key bed the highest note and the rightmost the lowest note. The mirroring defaults to C3, so the Bb major pentatonic key logic remains the same, except in reversed order, and concert pitch Bb2 is in D3. However, for improvising in B major, he restored the keyboard control voltage to normal. For example, in a concert video footage from Offenbach on September 28, 1978 (two months before the recording that ended up on the 8:30-album), Zawinul has placed a separate ARP 3620 duophonic keyboard-controller unit right on top of his suitcase Rhodes. From the video footage, it is evident that in the theme the higher notes come from the left side

and the lower notes from the right side of the keyboard. Keyboard setup and layout are presumably very similar in Offenbach and 8:30.

Mixer	Sequential Prophet-5	Oberheim 4-voice
ARP 2600P	ARP 3620 keyboard.	
ARP 2601 V3.0	Rhodes Mk II Suitcase	Unknown synth

3.2.5 Solo Transcription

Black Market (8:30 Live, second solo vamp)

Joe Zawinul

♩=120 even eights funky beat

ARP 2600 Syn Lead

Tenor Saxophone

Rhodes MK II

Fretless Bass Guitar

Drum Set

w/ Mu-Tron Bi-Phase
C#m11

B⁹/₄

[F#]

[G#m7]

B major pentatonic

Bars 1–4

A sudden half-step modulation after the signature bass riff in Bb-major leads into the second solo vamp in B-major. The propulsion for this solo section comes from Jaco Pastorius' sixteenth-note syncopated bass line and Peter Erskine's drum groove. The bass line contains some short offbeat notes that are the open strings of the four-string bass (sounding pitches E1, A1, D2, G2 but notated octave higher), despite their dissonant melodic-harmonic relation to the underlying harmony. That approach was extensively developed during the Motown era and by bassists like James Jamerson. It brings a certain funkiness to the bass line by introducing dissonant ghost notes. Especially during the first half of the solo, the bass line contains more dissonant outside notes (or chromaticism) than the other melodies.

In bar 2, Wayne Shorter plays a long G#3, after which Joe Zawinul introduces his ARP 2600 lead sound by playing a short phrase into the tonic I chord on the third bar of the four-bar vamp. Throughout bars 1 to 16, Zawinul uses the B-major pentatonic scale exclusively. Naturally, the notes of B-major pentatonic are also included in the closest scale to C#m7, the C#-Dorian, like several other scales (for. ex. C#, G# and D#-minor pentatonic or E, B and F#-major pentatonic.) Judging by Zawinul's melodic lines on the ARP until bar 16, his internal hearing is rooted in B-major pentatonic for both chords. In other words, he plays modal lines over the underlying functional harmony. This reinforces an indigenous world music vibe in the solo. He places his synthesizer lines with a distinct “over-the-time” feel that I have notated as quintuplet eighth notes over two quarter notes (5:2), but they could be just heavily laid back eighth note triplets. Either way, it brings out the phrase from the underlying straight sixteenth-note groove and increases tension. In bar 4, he answers his synthesizer line with Rhodes comping on the I chord that is rhythmically in the pocket with the sixteenth note groove of bass and drums, leading back into the IIm7 (C#m7). The tension and release effect is created by resolving the over-the-time feel of the synth melody into the Rhodes comping, which is rhythmically aligning with the bass and the drums. The top notes of the Rhodes comping voicings are also predominantly inside the B-major pentatonic (home) scale. The drummer Erskine is interacting with Zawinul’s synth line by playing melodic fills in bars 4 and 5.

The musical score for bars 5-8 is presented in a multi-staff format. The top staff is for Synth, showing a B major pentatonic scale in bar 5, a pickup phrase in bar 6, and a B6 arpeggio in bar 8. The Tenor Saxophone staff is mostly silent. The Rhodes staff shows chords C#m11, B9, and [G#m7]. The Bass staff includes notes [F#] and [G#2]. The Drums staff shows a melodic fill in bar 5.

Bars 5-8

In bar 5, Zawinul plays a similar B-major pentatonic synth line to bar 2 with a slight variation, like a repeated question. This time the pickup phrase aims at the second bar (IIm7) of the four-bar vamp and the answering Rhodes comping on the IIm7 chord includes an important character note e (b3 of the IIm7-chord). The top note of voicings still mostly follows the B-major pentatonic throughout the phrase. Jaco Pastorius’ bass line marks a concert F#2 on the third beat of bar 6 and concert G#2 on the third beat of bar 8 that could hint towards V7 and VIm7 (or V7/IIm7) in his thinking. Pastorius tonicizes the target chords (IIm7 and I6/9) with a preceding V throughout the solo. Zawinul mostly chooses to ignore this when comping. At the end of bar 8, Zawinul plays a B6 chord arpeggio pickup aiming at the downbeat of bar 9. Erskine fills on the snare drum.

Bars 9-12

Zawinul plays Rhodes comping, and Shorter enters his crescendo F#3 note on the second beat of bar 10. In bar 11, Zawinul abandons his first thematic idea and introduces a new one.

Bars 13-16

Zawinul continues improvising the modal line in B major pentatonic over the IIm7 chord in bar 13. The top note of the Rhodes comping in bars 13-16 still follows the B-major pentatonic. In bar 16, the pitch A# is introduced to the pool of available melody notes, first by Shorter and then by Zawinul. Whether or not Zawinul picked up the idea from Shorter as a reaction is impossible to verify. However, the pitch a# was already used unnoticeably inside the Rhodes voicings (bars 4, 12, 14, 16). Introducing pitch A# in melodies provides a delicate shift towards increasing the melodic-harmonic tension. Also, in bar 16, Shorter starts his syncopated phrase that bridges over the 16-bar double bar line for 3 bars. Drums play a small fill to mark the 16-bar form and the downbeat of bar 17. Each player

increases the tension a bit in one way or the other towards the end of the first 16-bar form (four times the four-bar vamp).

Bars 17-20

After a small pickup from bar 16 to 17, Zawinul comps with his left hand, and Shorter's sparse line continues ascending the B-major scale. In bar 18, Zawinul plays a descending F#-major pentatonic pickup to I major and continues outlining the B-major pentatonic. One could also analyze these notes as a cell of three notes B4, C#5, and D#5 and a transposition pure fifth up (F#5, G#5, and A#5). Since bar 17, his left-hand comps simultaneously on Rhodes underneath the synth melody. In bar 20, the triplet synth pickup indicates an IIm9-arpaggio for the first time, as the tonally important pitch e is introduced in the synth line to anticipate bar 21. In bars 19-20, Pastorius marks chords B, C#m, D#m, and G#m with syncopated triad arpeggios. Erskine introduces the eighth-note offbeat on cymbals to increase the intensity before playing a syncopated fill on toms.

Bars 21–24

Zawinul lands his triplet pickup on E3 (b3 of the IIm7 chord) on the downbeat. After 16 bars of modal playing on B and F#-major pentatonic scales, he slowly starts introducing the chords' important tonal character tones (guide tones) on beats as he outlines the C#m7 chord in bar 21. Erskine briefly comments on toms and snare in the latter half of bar 21. In bar 22, Zawinul plays a tonal V7 (F#7) chord arpeggio pickup aiming at the major third (D#5) of the I-chord on the downbeat of bar 23. Erskine emphasizes the eighth note offbeat on cymbals even further.

The musical score for bars 25-28 is presented in a multi-staff format. The key signature is three sharps (F#, C#, G#) and the time signature is 4/4. The score includes the following parts:

- Synth:** Features a triplet pickup on the downbeat of bar 25. Bar 26 contains a whole note chord labeled "F# maj. pent.". Bar 27 contains a whole note chord labeled "B major pentatonic". Bar 28 ends with a whole note chord labeled "encl.". A page number "7" is located at the top right of the staff.
- Ten. Sax.:** Plays a rhythmic pattern of eighth notes throughout the four bars.
- Rhodes:** Chordal accompaniment. Bar 25: C#m11. Bar 26: F#7. Bar 27: Bmaj9. Bar 28: B7.
- Bass:** Features a triplet pickup on the downbeat of bar 25. Bar 26 contains a triplet of eighth notes labeled "[F#]". Bar 27 contains a triplet of eighth notes labeled "[F#]". Bar 28 contains a triplet of eighth notes labeled "[G#m7]".
- Dr.:** Drum part with various rhythmic patterns, including eighth notes and cymbal accents.

Bars 25–28

As Zawinul plays a short laid-back phrase over the bar line of bar 25, Shorter continues with a faster-syncopated riff in double-time. Zawinul continues modal playing in B and F#-major pentatonic. His comping on beats 3 and 4 could be a nod towards a tonicization V (F#). In the bass line, Pastorius plays a triplet fill for the last two beats of bar 26 that outline an F# chord as well. In bar 27, Zawinul plays a modal line in B-major pentatonic but uses a Bmaj9-voicing on the Rhodes. In bar 28, Pastorius plays a bass line that outlines a G#m7 with some outgoing sixteenth notes (concert E1 as a pickup, D2 and A1) that presumably are open strings of the bass. Erskine's eighth-note offbeat cymbals intensify even more.

Bars 33–36

All lines resolve to an IIm7, although Zawinul lands on a tension note F#5 11th of IIm7 if we consider the actual root, but he might just play modally in F#-major pentatonic. The overall focus shifts slightly to Shorter as he continues with another active syncopated tenor saxophone line. In bars 33–34, Zawinul plays a short tonal phrase on C#m7 and continues playing modally in B major pentatonic. Pastorius offers a variation in the first bar of the four-bar vamp for the first time. In bar 36, Zawinul regains the focus with a fast quintuplet phrase that catches the ear. The drums mark the end of the four-bar vamp with a small comment on the snare drum.

10

The musical score for bars 37-40 is presented in a multi-staff format. The top staff is for Synth, showing a melodic line with notes and rests. Annotations above the staff include [G7] at bar 37, [F#7#9] at bar 38, and [B6] at bar 39. Below the synth staff, scale and mode annotations are provided: 'G-Mixolydian avoid 3 and 4' for bar 37, 'F# dom. dim. avoid 1, b3 and 3' for bar 38, 'C arp.' for bar 39, and 'B Ionian' and 'B arp.' for bar 40. The Ten. Sax. staff shows a few notes in bar 37 and a long rest for the remainder of the section. The Rhodes staff shows chord voicings: G7 in bar 37, F#9 in bar 38, and B6 in bar 39. The Bass staff shows a rhythmic line with chord annotations: [C#7] in bar 37, [C7] in bar 38, [F#7] in bar 39, and [B], [D#m7], [G#m7], and [D] in bar 40. The Dr. staff shows a rhythmic pattern with asterisks indicating accents on the snare drum.

Bars 37–40

In bar 37, Zawinul's left-hand plays a G7 chord, making it a substitution V7/V7 instead of a IIm7. His synth line uses the G-Mixolydian scale but avoids 3 and 4 to get a five-note (pentatonic) scale. Meanwhile, Pastorius does not react to this and still plays the basic bass riff, which includes the root (written C#3) and the unaltered fifth (written G#3) of the IIm7 chord. In bar 38, Zawinul's left-hand plays a V9 (F#9), but his right-hand plays a double-time phrase inside the F# dominant diminished scale that again avoids three notes (1, b3, 3) to achieve the sound of a pentatonic scale. The F#9 of his Rhodes voicing partially clashes with the notes of the F# dominant diminished scale, but it creates a descending chromatic dominant chord sequence from bar 36 beat 3 to bar 39 (G#7alt.-G7-F#9) for the Rhodes. This is an excellent example of Zawinul's independent horizontal thinking between the hands. Pastorius reacts by playing a bII7 (C7) line but placing the natural fifth (G3) on the downbeat and F#3 only on the fourth beat. They both resolve to the I chord in bar 39, but Pastorius continues reharmonization by playing beats 3 and 4 as IIIIm7 and bar 40 VIIm7 (G#m7), and tritone substituted V/IIm7 (D). Zawinul plays in bars 39–40 B-Ionian but plays a distinctive sixteenth-note B-major arpeggio on beat 3. Erskine emphasizes the beats on cymbals.

Bars 41–42

In bar 41, Zawinul plays the IIm11 on the downbeat but changes it to the V9/V7 function (C#9) for beats 2-4. He plays an ascending C#13#11 arpeggio that could be a pre-arranged signal phrase for the other band members to move on. Shorter plays a slow three-note motive in bar 41. Pastorius plays a fill-in using the high register. Zawinul marks 3 and 4 in bar 42 as E/F# chord, while Pastorius plays a leading tone (written A#2) on the beat 4. Erskine fills bar 42 before the main vamp of “Black Market” starts again.

3.2.6 Summary

The most essential concept of Zawinul’s solo is the “inner dialogue” between his ARP2600 synthesizer and Rhodes. The inner dialogue is particularly notable during the first half of the solo, and functions as a tool for controlling the tension level. The laidback synthesizer melodies build tension that is released by comping on the Rhodes “in the pocket” with the bass and the drums. His solo sound has a monophonic woodwind-like attack and body, which substantially affects his phrasing. Another notable concept is using a “common denominator pentatonic scale” throughout the first 16 bars of the solo that keeps the melodic-harmonic tension consonant. As the solo develops, Zawinul adds elements of tonal jazz language and pentatonic reductions of modes and symmetric scales to his synthesizer solo line. In addition to the inner dialogue, a musical conversation occurs among the band members. It has more to do with giving space and creating contrasting elements than motivic interaction where players exchange obvious rhythmic or melodic motifs.

3.2.7 Audio & Video Examples

3.2.7 Audio 1 Weather Report. “Black Market.” 8:30 (second solo vamp)

https://youtu.be/QEP_zK1O0bI

3.2.7 Video 1 Oscar, Visa “Black Market.” 8:30.

(Second solo vamp Zawinul’s ARP 2600 synthesizer & Rhodes MK II parts imitation)

<https://youtu.be/sMkFSELnwVQ>

3.3 “BRAZILIAN SUGAR” (GEORGE DUKE)

The “Brazilian Sugar” track is taken from George Duke’s fifteenth studio album, *A Brazilian Love Affair* (Epic, 1979). The song features a 36-bar form divided into three sections: A (20 bars) B (8 bars), and C (8 bars). Rhythmically, the track relies significantly on a two-bar “telecoteco” rhythm pattern interwoven into the hi-hat part of the drum groove by Brazilian drummer Roberto Silva. In the B part, the rhythm arrangement changes to baião for eight bars, only to return to the telecoteco for the C part.

3.3.1 Solo Sound

The following estimation is based on the sound of the original recording, discogs.com liner notes, and other available facts regarding the recording locations, available equipment, etc. The solo is played on a Moog Minimoog Model D. Duke probably uses two oscillators with OSC 1 set to square wave and OSC 2 to narrow pulse wave. The oscillators are tuned very close to absolute unison, and the two oscillators’ remaining very slow pitch drifting creates a slowly flanging timbre. In the amplifier, OSC 1 is turned up (+12dB) and OSC 2 about 2/3 up (~0dB). This way, he drives the Minimoog’s 4-pole (24dB) ladder filter hard. The amplifier envelope sounds organ-like: fast attack, no decay/release, and maximum sustain. The filter envelope creates the “snappy” attack, translating to fast attack and no release settings. (Release on a Minimoog is controlled with a separate switch that combines the decay and release times into the decay potentiometer.) The cutoff frequency is somewhere at twelve o’clock, and Duke uses notable keyboard filter tracking (at least the 2/3 switch on), since the lower notes sound softer than the higher notes. The envelope amount (in Minimoog labeled “contour”) is slightly shy from eleven o’clock. There is also a little bit of glide. The Minimoog keyboard is in mono legato and low note priority mode by default.

Signal processing was used to enhance the sound of the Minimoog. The album was recorded in several studios located in the U.S. and Brazil. The preamps could be, for example, from Neve V3 or SSL G-series consoles (both available at Westlake Studios A & B, Los Angeles.) However, considering the studio prices and logistics, my first guess would be that Duke recorded keyboard overdubs in his own studio, Le Gonks West, which is also listed as a recording location. The attack portion of the sound is further emphasized with a compressor that slightly saturates the transient peaks, which enables his notes to cut through the mix and speak rhythmically. An Urei 1176 peak limiter could have been used for the compression effect, but plenty of other options are also possible. Duke also used a hall reverb. For example, one of the earliest digital reverbs, the Lexicon 224, would be a strong bet in the year 1980.

3.3.2 George Duke’s Synthesizer Influences

George Duke was always proud of his jazz and blues roots, and he mentioned Yusuf Lateef’s flute playing in the Cannonball Adderley sextet as one of his main influences when searching for his synthesizer soloist voice. Surprisingly, he did not try to mimic guitar players, although he was aware very early of Jan Hammer’s synthesizer style (Kovarsky 2013.) He even mentioned that he deliberately chose the ARP Odyssey to look for another approach after hearing Jan Hammer’s Minimoog solos in The Mahavishnu Orchestra. Duke recalled, “It was a little different from

a Mini-Moog, and eventually I went on to play both, but I decided to make the Odyssey my instrument, and I played that mostly with Frank [Zappa]" (Ekers 2012). It is also notable that in his youth, Duke played the slide trombone and even overdubbed some trombone parts for his 1973 album *The Inner Source*. This could also consciously or unconsciously affect his approach to synthesizer soloing.

3.3.3 George Duke's Synthesizer Techniques

Duke often used larger pitch bend ranges than the usual major second. For example, he would set his pitch bend range to a perfect fourth and do smaller intervals by ear, practicing until the bender positions of each interval were in his muscle memory. "It's not critical that they be perfectly in tune, sometimes playing in the cracks adds to soulfulness" (Ekers 2012). Since most of the time notes were bent upwards to a target note, he later started using a one-octave pitch bend-down setting to create whammy-bar style dive effects.

As I noted in the solo transcription, Duke seldom used the modulation wheel for creating vibrato, but preferred to bring on a similar effect by subtly wiggling the pitch bend. In this thesis I call this "micro bending", since the changes in pitch usually stay in the micro interval category. This leaves the modulation wheel available for tasks such as larger amplitude modulation effects or audio range LFO to filter modulation, both a part of Duke's playbook. Creating constant variation to the solo sound timbre was crucial for Duke, and he often controlled filter cutoff with a foot pedal to create timbral variation even when both hands were on keys.

Duke's article in the book *Synthesizer Technique* (Milano 1987) discusses how to construct a solo and craft the solo arch to achieve the maximum psychological effect for the audience. A partial "Brazilian Sugar" solo transcription (by an unknown author) is attached to the article, and Duke also highlights how he used a motif-based approach for the solo. However, in this thesis my analysis relies solely on my complete solo transcription, which I did before I found the abovementioned printed version.

3.3.4 Solo Transcription

Lead 1 (Square)
Electric Bass

Brazilian Sugar

George Duke

Partido Alto Samba (teleco-teco)

motif a

2

3

4

E minor pentatonic

Cmaj⁹

Am⁹

Em⁹

Em:

bVI^{maj}9

IV^m9

I^m9

Bars 1-4

In the first A part, George Duke introduces a three and half bar motif a in the E-minor pentatonic scale. He uses pitch bend to nuance notes by rapidly bending them upwards less than a semitone (micro bend notated with a small

boomerang after a note head) after the start of a note. The anticipated downbeat of bar 3 contains the first of many micro bends found in this solo.

5
 (E minor pentatonic)
 Fmaj⁹
 bIIImaj⁹

Bars 5–8

Duke develops the motif a by repeating it compressed (a'), halving its length into one and a half bars (bars 5-6). He compresses the motif "a" even more for the third repeat (a'') in bar 7 and displaces it rhythmically. He elaborates on motif a in bar 8 (a''') and moves on.

9
 (E minor pentatonic)
 D¹³(sus⁴) D¹³ Am⁹ Am^{6/9}
 G: V¹³ sus⁴ V¹³ IIm⁹ IIm^{6/9}

Bars 9–12

The first phrase ends with a descending line in bars 9 and 10. In bars 11-12, Duke plays a group of descending fast notes in G-major and repeats a similar melodic cell temporally expanded.

13
 (E Ionian)
 F#m¹¹ G#m⁷ G#m⁷(#⁵) G#m¹¹
 E: IIm¹¹ IIIIm⁷ IIIIm^{7#5} IIIIm¹¹

Bars 13–16

After an extended stay on the 11th of F#m7, Duke plays an ascending motive in E-major. In bar 16, the line reaches the high point and descends the E-major scale.

Bars 25–28

In bars 25 and 26 I used septuplets and sextuplets to fit the correct number of notes inside a measure. In practice, they are sixteenth notes that drag or push slightly, except at the end of bar 26 where the last two groups of sixteenth notes inside a sextuplet are much faster than the rest of the phrase. In bar 26, some inaudible notes and rhythms could result from a fast crossfade edit between two solo takes. In bars 27 and 28, Duke reaches the high point of the phrase and finishes it with eighth notes in A-minor pentatonic. Notice the micro-bent blue note between the minor and major third in bar 27.

29 $\overline{C1}$

30 *pre-bend over Minimoog's keybed*

31

32

pred. E Aeolian

Em⁷ Am⁹ Gmaj⁹

Em: Im⁷ IVm⁹ \flat IIImaj⁹

Bars 29–32

Song section C starts with a much-needed break. In bar 30, Duke begins with a pre-bent note that continues into a descending line that predominantly uses the E-Aeolian scale. Notice the micro bend on the anticipated downbeat of bar 32. He starts building the last phrase of this section and the 1st chorus.

33

34

35

36

E Ionian D Mixolydian

Emaj⁹ D⁹(sus4)

E: Imaj⁹ \flat VII⁹sus

Bars 33–36

He plays an ascending phrase in bar 33 and the first half of bar 34 using the E-major (E-Ionian) scale. In the latter half of bar 34 to bar 36, he uses the D-Mixolydian scale. He builds toward the high point with syncopated triplets and peaks on a long C6 note on the second beat of bar 36.

37 $\overline{A2}$
 E Aeolian
 $Cmaj^9$
 Em: $bVI maj^9$
 38
 39
 40
 Am^9
 Em^9
 IVm^9
 Im^9

Bars 37–40

The second chorus starts with a common note idea. Duke uses a repeating major third interval and colors the long B5 notes with a micro bend that practically briefly reaches C6. The note b also works as a common tone that ties together the $bVI maj^9$ - IVm^9 - Im^9 chord sequence (note b is a chord tone in each chord). In bar 40, he compresses the rhythm and widens the interval.

41
 (E Aeolian)
 $Fmaj^9(\#11)$
 $bII maj^9/\#11$
 42
 Em arp.
 E minor pentatonic
 43
 44

Bars 41–44

For the $bII maj^9/\#11$, Duke primarily uses the E-minor pentatonic scale. In bars 42–43, the idea of a repeating upward leap continues with widening intervals. The E-minor arpeggio strengthens my assumption that Duke hears the phrase in E-minor over the F-pedal.

45
 D Mixolydian
 $D^{13}(sus4)$
 $G: V^{13} sus^4$
 46
 E Blues Scale
 D^{13}
 V^{13}
 47
 48
 Am^9
 $Am^{6/9}$
 $II m^9$
 $II m^{6/9}$

Bars 45–48

Duke plays triplets that give a slight against the time feel but returns to basic eighth notes for the next bar. The Roman numerals are analyzed according to G-major tonality, but Duke might still think of the E-blues scale.

49 motif b 50 51 motif b' 52

E Ionian

F#m⁹(add11) G#m⁷

E: IIm⁹/11 IIIIm⁷

Bars 49–52

In bars 49–50, Duke plays a two-bar motif b in E-Ionian and its variation in bars 51–52 (motif b').

53 (E Ionian) 3 Am⁹ 54 pitch bend two semitones up to reach the notes above the keyboard F#m⁹(add11) 55 motif b'' 56 E Aeolian A¹³(sus4) Am⁷ Em¹¹

IVmaj⁹ IIm⁹/11 Em: IV13sus IVm⁷ Im¹¹

Bars 53–56

This segment is the build-up for the end of the A-section. Duke gradually climbs higher using the E-Ionian scale. The phrase peaks on the last upbeat of bar 54, which anticipates the IVm7 chord and E-minor scale. Bars 55–56 contain another variation of motif b from bars 49–50 (motif b'').

57 3 58 59 Bbmaj⁷ 60 1 7 1 3 5 7 1 7 1 60 7 1 7

pred. Dm7 arp. encl. C-Mixolydian

Bbmaj⁹/D C⁹(sus4) Bbmaj⁹/D C⁹(sus4)

F: VIm⁷(add^{b6}) V⁹sus VIm⁷(add^{b6}) V⁹sus

Bars 57–60

The second B-section starts with a downward Dm7-arpeggio that continues in bar 58 over the C⁹sus4 chord. Bar 58 contains a chromatic approach figure that targets the B^b4 on the fourth beat and continues as an ascending Bbmaj7-arpeggio that ends with a repeated semitone bend. Duke plays a line for two bars that tonally anchors the Bbmaj7 chord over the D-pedal.

61 (C-Mixolydian) 62 63 64

encl. F triad arp.

$B\flat\text{maj}^9/D$ $C^9(\text{sus}4)$ $B\flat\text{maj}^7$ $A\text{m}^7$

$V\text{Im}^7(\text{add}\flat^6)$ $V^9\text{sus}$ IVmaj^7 IIIm^7

Bars 61–64

The semitone bend idea continues in bar 61 and evolves to a whole-tone bend in bar 62. In bar 63, Duke uses a long B3 as a part of a chromatic approach to C4 (minor third) of Am7. Because of the one-and-half-beat long B3, it would be possible to analyze the Am7 as an IVm of E-minor. Still, as the line continues with an ascending F-major arpeggio at the end of bar 64, I would keep Am7 as an IIIIm7 chord and B3 as a chromatic approach note.

65 motif c 66 motif c' diatonic transposition 67 motif c' 68 motif c''

E Aeolian

$E\text{m}^7(\flat^6)$ $A\text{m}^9$ $G\text{maj}^9$

$\text{Em}:$ $\text{Im}^7\flat^6$ IVm^9 $\flat\text{IIImaj}^9$

Bars 65–68

The second C-section continues with a descending diatonic motif c in E-Aeolian over bars 65–66. From bar 67 until 68, he varies the motif c by adding a fourth pitch (motif c') and making it a “triplets in groups of four”-polyrhythm displaced inside the 4/4 bars. The last note of the last group of four is approached with a skip instead of a step (motif c''). The ascending arch and polyrhythm of bars 65–68 increase the energy level and aim for a resolution on the downbeat of bar 69.

69 70

$G\text{maj}^7$

5 7 1 5 3 1 3 5 pt. 7 7 2 7 pt. 5 5 5 et. 3

pred. E major $E\text{maj}^9$ $D^9(\text{sus}4)$

$\text{E}:$ Imaj^9 $\flat\text{VII}^9\text{sus}$

Bars 69–72

After the apex on the downbeat of bar 69, the line turns downwards and descends one octave of E-major scale from B5 to B4. In bars 71–72, Duke outlines Gmaj7 as an upper structure on top of the D9sus chord.

3.3.4 Summary

While the other four solos are either live recordings or, based on the orchestration, at least plausible live takes in the studio, this is most certainly an overdubbed solo. It contains several two-handed piano and Rhodes accompaniment tracks underneath the synthesizer solo track, which requires two-handed playing. All keyboard tracks are credited solely to Duke. The most notable feature is “the pocket”, in Duke’s phrasing, which brings the “on top of the beat” rhythmic authority to the solo. His line contains half-, single-, and double-time phrases and a few poly-rhythms. As my analysis shows, throughout the solo he utilizes compositional motif development techniques that he discussed frequently in his lessons and interviews. The melodic-harmonic approach is predominantly modal language: pentatonic scales and modes of the major scale. Usually, he uses a “common denominator” scale to play through several chord changes. He stays inside the modes and does not utilize standard modal outgoing techniques such as sideslipping or superimposition. His strategy for animating the synthesizer sound uses micro bending on the pitch bend after the attack of the note instead of an LFO-based vibrato on the modulation wheel.

3.3.5 Audio & Video Examples

3.3.5 Audio 1 Duke, George. “Brazilian Sugar.” *Brazilian Love Affair*.

(Synthesizer solo by George Duke)

<https://youtu.be/F1874ujJAbQ>

3.3.5 Video 1 Oscar, Visa. “Brazilian Sugar” synthesizer solo imitation

<https://youtu.be/Jfh5HPV9GIQ>

3.4 “GOT A MATCH?” (CHICK COREA)

3.4.1 Technical Details

By 1985 Chick Corea had adopted FM synthesizers (namely a Yamaha DX7 and a New England Digital Synclavier) into his touring setup, and he was hiring technicians to program layered sounds containing multiple modulation routings that could be controlled with keyboard velocity and aftertouch (as seen in the video “Electric Workshop”) (Corea 2002). This technical development presumably played a big role in enabling him to play “Got a Match?” in a more traditional hard-bop fashion. The synthesizer solo in “Got a Match?” contains typical hard-bop language and phrasing that would have been nearly impossible to acquire on a Minimoog (or any other early mono analog without keyboard velocity tracking). Due to Corea’s decision to perform the song on the Yamaha KX5 37-key keytar midi controller, he was predominantly tied to a right-handed keyboard performance, because his left hand supported the keytar’s sidebar and operated the ribbon controller for pitch bending and vibrato. The KX5 controlled (via DIN MIDI) a Yamaha TX816 rack-mount polyphonic FM tone-generator (in practice, eight DX7 synthesizers in one chassis).

Out of the five solos discussed in this thesis, this is the only solo that I had studied from a printed transcription in my youth. The book *The Chick Corea Elektric Band Authentic Keyboard Transcriptions* (Corea 1986) contains a detailed solo transcription of “Got A Match?”. Despite my previous (not so successful) attempts to study the solo in the 1990s, I learned this solo in a similar way to all the other four solos, by using aural imitation methods, before I wrote the transcription that is the basis of my analysis.

3.4.2 The Solo Sound

Chick Corea’s solo sound was polyphonic. It responded to keyboard velocity by brightening the overall timbre at higher velocities and darkening at lower velocities. He also used the same sound for light chordal comping under the bass and drum solos.

I have emulated Corea’s lead sound by studying all the available technical details from album covers and instructional videos. After that, I loaded all TX816 factory patches as MIDI system-exclusive files (.syx) into Native Instrument’s FM8 plugin. From there, I layered sounds together by opening them on multiple instances of the FM8 plugin in Apple MainStage. By trial and error, I found the most satisfying result and similar characteristics from combining these four sounds, one in each instance of the FM8 plugin:

- 1) E.PNO 14.2 (detuned -5 cents, pan -20, -3dB)
- 2) E.PNO 14.2 (detuned +5 cents, pan +20, -3dB)
- 3) H.SYN 25.6 (bass cut 24db/oct in 100 Hz, pan C, 0dB)
- 4) TIGHT BR.A (pan C, 0dB)

In the FM8, I adjusted each sound’s LFO rate to 45 and routed it via the modulation wheel to pitch on level 23 for a unified vibrato. I also routed each plugin to a hall reverb bus. Although my emulation accurately captures the essence of Corea’s lead sound, it is almost certain that his original sound was made differently.

3.4.3 Improvisatory Concepts

The original album version was performed with a trio consisting of a synthesizer, bass, and drum set. Due to the physical restrictions of the keytar, the song contains mostly single-note lines and occasional sparse one-hand chord voicings. Hence, there is no chordal accompaniment during the synthesizer solo, and all melodic-harmonic impressions result from Corea’s melody lines projected against John Patitucci’s bass lines. While this kind of texture was quite atypical of Corea’s output, it indeed had its place in the jazz tradition, where several hard-bop-era trios (for example, Sonny Rollins Trio) performed with horn, bass, and drums line-up without a harmony instrument. The trio line-up offered more spectral range and more harmonic freedom for the players, but also brought them more into focus, as Sonny Rollins said:

When I’m playing trio, everybody has to know what they’re doing... Everybody’s out front. Even if they’re supporting me.

(Chinen 2017)

I want to present a concept (or a gesture) that Corea uses several times during the “Got a Match?” solo. It is not rational to claim that my explanation would be exactly how he thought, but it offers possibilities for explaining and achieving a particular sound. In the introduction (see 3.4.3 Note Example 1), Corea superimposes a bVIm6 arpeggio on top of the V7.

3.4.3 Note Example 1 “Got a Match?” introduction.

The mediant minor chord substitution is a phenomenon that has been used widely in Western art music and film scores. Theoretically, the bVIm6 is derived from the D-harmonic minor scale.¹⁶ The Brazilian composer Antonio “Tom” Carlos-Jobim is also known for using this chord as a substitution for a V7 in several of his works (Bastos and Lopes 2020). It deserves further investigation here, as it also seems to be an essential concept for Corea. He uses the

¹⁶ The minor 6-arpeggio was a typical improvisational device for McCoy Tyner and John Coltrane.

bVI_m6 as a direct substitute for a V7 in his original compositions or as a superimposition on top of the dominant in his improvised lines (see 3.4.3 Note Example 2).

3.4.3 Note Example 2 "Duende" theme by Chick Corea

In the tonal environment, the difference between a V7#5b9 and bVI_m6 is relatively small, since the A-altered scale (V7alt.) is the seventh mode of a Bb-jazz minor. Another tonal harmony explanation could be the tritone substitution of an II-V (Em7-A7 -> Bbm7-Eb7). However, a similar superimposition happens again later in the solo, albeit in a more modal fashion.

3.4.3 Note Example 3 "Got a Match?" second solo chorus

At the opening of the second solo chorus (3.4.3 note example 3), Corea introduces a four-note melodic cell (a) (b7-1-4-b3) in D-minor pentatonic that creates m7 sound because character notes F3(b3) and C3(b7) fall on beats. He transposes a permutation of the cell (a) (4-b3-1-b7) down a major third to Bb-minor pentatonic (Bbm7, bVI_m7) over the V7 chord, moves the original cell (cell a) a pure fourth down to A-minor pentatonic (Am7, II_m7/IV_m) over the Dm (creating extension Dm11), and finally plays an imitated variation (cell b) of the Bb-minor cell (4-b3-1-b7) in Eb-minor pentatonic (5-4-b3-b7) (Ebm7, bII_m7 as the first part of a tritone substituted II_m7-V7/IV_m) over the D7, V7/IV_m.

It is noteworthy that in this case the modal minor seventh chord superimpositions and their minor pentatonic scales are not just a selection of notes from the V7-altered scale tone palette but substitute an important character

tone, the b7 (of the original V7 chord), with a natural 7. This creates a different and more mediant sound that can still be connected to the underlying tonal harmony. Of course, one can analyze the whole phrase as sideslipping between D-minor pentatonic and Eb-minor pentatonic. It is fitting, too, but I find the first explanation much more inspiring. This gesture is not the most characteristic feature of Corea's playing, but is still a noticeable stylistic trait. Some of Corea's most recognized trademarks, such as the flamenco cadence, are not found in the "Got a Match?" solo.

3.4.4 Solo Transcription

Got a Match? Chick Corea

Intro $\text{♩} = 300$ Up-Jazz

The notation shows a synth line with the following annotations and fingerings:

- Bar 1: **Dm** (5 1 b3 5 b3 1 5 2) with *Dm arp.*
- Bar 2: **Bbm6** (6 5 b3 1 3) with *Bbm6 arp.*
- Bar 3: **Dm7** (b3 pt. 1 b7 5 b3 4) with *pred. Dm7 arp.*
- Bar 4: **Dm** (app. b3) and **D7(b9)** (b9 3 1) with *D jazz min.* and *G harm. min. V*.

Bars 1-4

On the first bar, Corea plays a D-minor arpeggio up and down to define the key of the song. The arpeggio also contains the same pitches that start the main melody later. Starting with a variation of the theme's melodic motif is an excellent way to tie the improvisation to the composition. The second bar contains the first alternate route of many. A Bbm6-chord is outlined in a downward arpeggio. Of course, it could be also analyzed as an altered V7 chord (A7#5b9). However, the mediant flavor of substituting a bVIIm6 (Bbm6) instead of a conventional V7 is a concept that seems to be recurrent in several Corea's compositions and solos. Bar 3 is a Dm7-arpeggio with one passing tone (pt.) The first quarter note of the phrase on the first upbeat is articulated long and bent half step up from E5 and returned on the second upbeat. Bar 4 contains downwards scalar movement and a dominant (D7b9) for IVm that would be expected in bar 5.

The notation shows a synth line with the following annotations and fingerings:

- Bar 5: **D7** (at. 5 4 6 b7 pt. 5) with *Ebm7 arp.*
- Bar 6: **Ebm7** (b7 5 b3 1 7 9) with *Ab9 arp.*
- Bar 7: **Ab9** (b7 5 3 5 b7) with *pred. Gm arp.*
- Bar 8: **Gm** (5 8 5 pt. b3 1)

Bars 5-8

However, bar 5 starts with the anticipated long D2 that could be a fifth of IVm (Gm, as it would be in the form). Since no other pitches are played one could also see it as a continuing V/IVm (D7) that develops in bar 6-7 to tritone substituted IIIm7-V (Ebm7 Ab9) before finally resolving to IVm (Gm) in bar 8. It is notable that although in the form the Gm represents IVm in the song's harmony, Corea treats it as a new Im in improvisation with his preceding IIIm7-V7 line.

Bars 9-12

Bar 9-11's original harmonies are similar to the first three bars of John Coltrane's hard-bop original "Moment's Notice". In bar 9, Corea marks the A-triad and anticipates the IIm7-I in Eb-major by starting a chromatic major third idea from the third beat that can be seen as a skip from the third to the root. In bar 10, the downbeat follows the same logic, but the downward skip to upbeat is only a minor third that continues to be a IIm7 (Fm7) arpeggio. From the third beat the arpeggio changes to Eb6, resolving the line two beats earlier than expected to I6 for the end of bar 10 and most of bar 11. In bar 12 (starting from the upbeat of 11), a three-note enclosure targets the fifth of A7b9 on the second beat and continues as an arpeggio to the leading tone (C#4). The resolution is delayed with a downward jump to (Bb3) on the last upbeat before hitting the root of Im (Dm).

Bars 13-16

Bar 13 resolves on the downbeat to D4 and continues outlining the Im by arpeggiating the Dm-triad down and up. Bar 14 contains a IIm7b5-V7#5 cadenza that is divided 3 beats scalar movement in G-jazz minor for IIm7b5 and four beats of arpeggio for A(#5) extending the cadenza over the bar line to bar 15 before resolving to root and Im on the fourth beat of bar 15. Bar 16 contains a break and prepares for the main theme starting on the upbeat.

After the head (main theme) has been played twice, Corea continues improvisation on top of the rhythm section provided by bassist John Patitucci and drummer Dave Weckl.

Got A Match? (synth solo)

Bars 0-4

The bar 0 pickup to bar 1 contains an enclosure that targets the fifth of Im (Dm) on the downbeat. It can be seen as a V7b9 to Im, where Bb4 (b9) is resolving to A4 (5). A similar motif is repeated in bar 2 with a variation. Now the line jumps a perfect fourth up from A4, which is displaced one eighth note earlier. Bar 4 contains a two-note enclosure targeting the D5 of a V7b9/IVm.

Bars 5-8

Bar 5 contains an immediate resolution to IVm (Gm) with a minor third (Bb4) on the downbeat followed by root on upbeat that becomes an Im. As mentioned earlier, in tonal jazz language, a target preceded by a V7 or IIm7-V7 becomes an I in improvisation regardless of its function to the key. In other words, the ear prefers the simplest solution, which is often a modulation. In bar 6 a D-major triad arpeggio outlines V chord as it appears on the composition. Bar 7 contains a resolution to Im for the first two beats and another V (D) for the last two beats. The enclosure resolves into the root of Im (Gm).

Bars 9-12

In bars 9-10, Corea outlines the V chord directly, omitting the IIm7. The line resolves into major third (G4) of Eb on the upbeat of four in bar 10. Bar 11 contains a long descending line starting on the upbeat of two that chains leading tones and enclosures. Beats three and four in bar 11 can be seen as an enclosure leading to the downbeat of bar 12. One can think that the chromatic line on beats 1-2 of bar 12 would be following the C dominant bebop scale that is also frequently used for an m7b5 major third up (Em7b5). Beats 3-4 contains a chromatic enclosure resolving to the root (A4) of A7.

Bars 13-16

Bar 13 contains three beats of descending chromatic scale followed by a descending motive in D-harmonic minor. The line resolves on the second beat of bar 14 into Im and does a second quick V-I (Dm) on the upbeat of four going to beat two of bar 15. Bars 14 and 15 are also a resolution of a tension arc, which has been built since bar 11.

Bars 17-20

The second chorus starts with a minor pentatonic (Dm7) four-note cell that is transposed major third down (Bbm7) in bar 18, where it can be analyzed as a reference to tritone substituted IIm7-V7 (Bbm7-Eb7). In bar 20 it transposes to Ebm7, a tritone substituted IIm7-V7/IV (Ebm7-Ab7) with a small variation. The phrase rhythm of bars 17-18 is identical to bars 19-20. These four bars are discussed further on page 57 in 3.4.3 note example 3.

Bars 21-24

In bar 21, a three-note Gm-arpaggio acts as a resolution before a four-note enclosure targeting the third of D7b9 on the downbeat of bar 22. Bar 22 continues as a descending G harmonic minor that leaves V7 hanging until bar 24 resolves into the Im (Gm) by placing the root and third on beats.

25 [A7] pt. 3 5 1 b7 26 [Bb7] [Eb] 27 28 [Asus4b9]

(encl.) A(addb9) arp. encl. encl. cell 1

Em7 A7 Fm7 Bb7 Eb Em7(b5) A7

Bars 25–28

Bar 25 continues a four-note chromatic enclosure to the root of A(addb9) on the second beat, followed by an arpeggio ending in an anticipated b7 note of Bb7 chord in bar 26. The chain of enclosures starting from the third beat of bar 26 can be analyzed in many ways. Beats 3–4 may represent an anticipation of an early resolution to I (Eb), or the V7 (Bb7) could be delayed until the third beat of bar 27. In that case, the line starting from G3 would mark a Bb13 and turn into an altered Bb7 on the downbeat and back to Bb7 on the second beat before resolving to Eb3 on the third beat. Or, it can be analyzed as a chain of enclosures connecting G3 to Eb3. In the chromatic passage in bar 28 beats 1–2. Corea may think of the C-dominant be-bop scale. That would be consistent with the tradition and similar cases in this solo, considering standard practices to outline the IIm7b5 chord tonally. Beats 3–4 contain the first four-note cells of a descending note cell sequence.

29 30 31 32

cell 2 cell 3 cell 4 cell 5 cell 6

[Eb7#11] [Dm]

1 mt. 1 32 app. 5 b3 1 app. 1 b3

Dm A7 Dm gvb

Bars 29–32

Bar 29 starts with the second cell, which has rhythmic alteration and outlines a G-minor triad. The following bar and a half contain eighth note cells 3-5 that begin on the beat in different permutations. The third one (C5, B4,G4,F4) and the fifth one (Bb4, F#4, F4, E4) are similar in shape and contain four notes (running sequentially from the highest to the lowest note), while the fourth one (B4, F4, F#4,B4) contains only three notes and alters the running direction by jumping from the highest to lowest followed by the middle one and repeating the highest to maintain a group of four eighth notes. These patterns usually have more to do with the physical keyboard layout and rhythmical patterns in players' muscular memory than specific melodic-harmonic references. The sixth cell outlines a Bbmaj7 chord (already marked Dm in the notated example) and resolves into Dm on the offbeat of four.

33 [Dm] 34 35 36 [D7b9]
 KX5 (8) Dm A7/C# Dm/C Dm/B
 Bass

Bars 33–36

The third chorus starts with a much-needed break. Bar 36 contains a dotted quarter-note D3 and an eighth note Eb3 that hints towards a V7b9/IV (D7b9). The rhythm section no longer changes to the half-time feel backbeat but remains in the straight-ahead domain until the end.

37 5 b3 1 1 38 [D] 5 3 39 1 3 1 40 5
 KX5 Gm arp. D arp.
 Bass Gm D7/F# Gm/F Gm/E

Bars 37–40

Bar 37 resolves into G-minor with a downward arpeggio. Bar 38 is a similar motion with a D-major triad rhythmically extended to bar 39. This anchors the tonality.

41 [A] [Bb7] 42 [Eb] [Bb] 43 [A7b9] 44
 KX5 A arp. E dim arp.
 Bass Em7 A7 Fm7 Bb7 Eb Em7(b5) A7

Bars 41–44

Bar 41 contains a downward A triad arpeggio and an anticipated b7 of Bb7. A motive of dotted quarter note followed by an upward jump of diatonic sixth eighth-note continues for bars 42 and 43. The b7 (Ab3) of bar 42 resolves into a major third (G4) of Eb on the downbeat of bar 43. Bar 44 contains an E dim arpeggio that resembles a V7b9 (A7b9) arpeggio.

45 *laid back* 46 47

KX5

Bass

D Blues Scale

Dm Bb7 A7 Dm

Bars 45–48

Bars 45–46 are written as the audio sounds, but the ossia shows the phrase Corea plays “laid back” in relation to the groove. This gives more expressive weight to the laid-back line. In bar 45, the line resolves into Im (Dm) on the second beat. Bar 46 contains the guide tone line (Ab4-->G4), marking Bb7 and A7. Bar 48 includes downward four-note cells on the D-minor blues scale. The rhythmic intensity starts increasing via consecutive strings of eighth notes.

49 50 51 52

KX5

Bass

[Dm] [Eb7] [D7b9]

Dm A7/C# Dm/C Dm/B

D (addb9) arp.

Bars 49–52

The four-note D-minor blues scale motive is permuted in bar 49. Bar 51 starts with an Eb7. Bar 52 beats 1-2 contains a D(addb9) arpeggio and a figure that anchors A4 on beats.

53 54 55 56

KX5

Bass

[D7b9] [Gm]

Gm D7/F# Gm/F Gm/E

4 note cell

Bars 53–56

Bar 53 continues a series of enclosures that eventually resolve to IVm (or after a V7 an Im) Gm on the third beat of bar 55. Bar 56 continues outlining Gm by placing the root, third and fifth on the beats.

4

57 [Em7] [A7]
b7 3

58 [Fm7] [Bb7]
b7 3

59

60

3/8 motif chromatic

5/8 motif chromatic

Em7 A7 Fm7 Bb7 Eb Em7(b5) A7

KX5

Bass

Bars 57–60

Bar 57 outlines a fast IIm7-V7 and settles a two-note motif that develops in bar 58 into a chromatic 3/8 phrase. The phrase evolves on the fourth beat of bar 59 into a four-note 5/8 motive. The tonal outline gives in for a chromatic development. It is also possible to analyse bars 57-62 as a guide-tone resolution of a constantly modulating IIm7-V7 sequence (Em7-A7 / Fm7-Bb7, F#m7-B7 / Gm7-C7, G#m7-C#7, Am7-D7 / Bbm7-Eb7, Bm7-E7, Cm7-F7 / C#m7-F#7, Dm7-G7, D#m7-G#7 / Em7-A7, Fm7-Bb7, F#m7-B7)

61 5/8 motif 1/8 displacement

62

63

64 [A7b9] encl.

Dm Bb7 A7 Dm

KX5

Bass

Bars 61–64

The 5/8 motive is displaced by one eighth note in bar 61. The phrase might reflect my suggested chord symbols, but it could also be interpreted just as horizontal chromatic development that builds tension. Bar 64 marks a V7b9 that resolves immediately.

65 [Dm] 5 b3 at. 5 b3

66 [Bbmaj7] 1 nt. 1 7 6 7 5 3 1 nt. 1 7 5 3

67

68 [D7alt] b13 pt. b5 pt. app. 3 encl.

Dm arp. Dm arp. Bbmaj7 arp. Bbmaj7 arp.

3/4 motif 3/4 motif

Dm A7/C# Dm/C Dm/B

KX5

Bass

Bars 65–68

Bar 65 resolves into Im (Dm) with a three-note arpeggio on downbeat with a connecting upper chromatic approach tone (cat) on the upbeat of beat two. Bar 66 evolves that single approach tone into an accented two-note approach figure that leads into a four-note Bbmaj7 arpeggio. The overall figure extends from a four-note motive (1+3) into a six-note motive (2+4). Bar 68 contains a descending chromatic passage and an upbeat enclosure that lands on the major third (F#3) of D7b9, creating a V7/IVm.

69 [Gm] 5 pt. b3 1 5 pt. b3 1 70 [Ab7] [D7] 1 b7 pt. 5 1 pt. b7 pt. 71 [Gm] b3 5 1 nt. 1 72

KX5

Bass

Bars 69-72

In bar 69, V7 is resolved immediately into Im (Gm) with a repeated four-note motive that contains the fifth and the third of the chord on beats. Bar 70 contains either an altered V7 (D7alt) or a tritone substitution V7 (Ab7). In either case it consists of four notes descending the Eb-jazz minor scale and four notes descending the chromatic scale (beats still feature Eb-jazz minor character tones). The line aims at the downbeat of bar 71 that marks the minor third of Im (Gm) and continues inside.

73 [A] 1 3 5 1 5 3 1 74 [Cm] b3 5 1 5 1 75 [Bb] [Gm7] b7 5 b3 1 5 3 76 [A] 1 3 5 1 5

KX5

Bass

Bars 73-76

Bar 73 features an A major triad arpeggio up and down followed by a downward jumping 3/8-motive on chord tones that starts from the second beat of bar 74 and continues until beat three of bar 76.

77 app. b3 78 [A7] 5 3 1 79 [Dm] 1 5 80 5 1 5

KX5

Bass

Bars 77–80

A descending half-note line acts as a count-in, securing the end of the chorus and preparing for the change of soloist in bar 81. Bar 78 features a slow enclosure resolving to the root of Im (Dm), followed by a faster one in bar 79.

3.4.5 Summary

As the melodic content in the solo uses idiomatic tonal bop language, it represents a rare exception in the history of recorded jazz synthesizer solos. Most early synthesizer players approached improvising from the modal viewpoint. The reasons for the modal language's domination at the dawn of jazz synthesizer solos lie equally in the general zeitgeist of the early 1970s jazz scene and the timbral qualities and playability of the early mono analog synthesizer. At the time of the recording of the "Got A Match?" solo, the technical advancements in semiconductor technology and Yamaha's new DX/TX synthesizers enabled Corea to use keyboard velocity as a modulation source to create dynamic and timbral variation between notes on beats and off beats. I believe this helps Corea to produce the idiomatic swing feel eight-note phrasing in his solo.

3.4.6 Audio & Video Examples

3.4.6 Audio 1 Corea, Chick. Chick Corea Elektric Band. "Got a Match?" *Chick Corea Elektric Band*

(Synthesizer solos by Chick Corea)

<https://youtu.be/bB9ad5uIRP0>

3.4.6 Video 1 Oscar, Visa. "Got a Match?" (Chick Corea's synthesizer solo imitation)

<https://youtu.be/iHuD5StVWko>

3.5 “GOSSIP” [LIVE] (MICHAEL BRECKER)

3.5.1 History

Michael Brecker performed the live version of “Gossip” on July 9, 1989, in Jazz Fest Wiesen, Austria, together with the Michael Brecker Group (Michael Brecker: Saxophone & EWI, Mike Stern: Electric Guitar, Jeff Andrews: Electric Bass, Joey Calderazzo: Piano & Keyboards and Adam Nussbaum: Drums). The recording was released in 1993 by the Berlin, Germany-based *Jazz Door* label and *ITM-Media* on an unofficial CD entitled *The Michael Brecker Band Live*, together with two other titles (“Original Rays” and “Nothing Personal”) from the same concert. This recording can be also found on several streaming services such as Spotify. Many people have also uploaded a multi-camera video of that concert (or parts of it) onto YouTube. So far, I have been unable to confirm the producer of the video. Judging by the professional production quality, my strongest guess would be the Austrian Broadcasting Company ORF.

3.5.2 Brecker’s Late 1980s EWI Setup and Technical Details

Michael Brecker’s unique melodic-harmonic language, superb technical skills, and great synthesizer programmer collaborators created an unbeatable combination. These collaborators, who helped Brecker in EWI sound design and playability research, include at least Nyle Steiner, Robby Kilgore, Judd Miller, Jim Beard, George Whitty, Matt Traum (from Patchman Music), and several engineers of Akai. Based on the available video material, Brecker performed Gossip solo with Akai EWI1000, the first mass-produced EWI based on earlier hand-made prototypes and designs of the EWI inventor Nyle Steiner.

According to the Akai owner’s manual, The EWI1000 connects to an EWV2000 sound module with a special multi-cable that carries control voltages from the EWI1000’s breath and bite sensors, touch buttons, octave rollers, and bend plates. The EWV2000 sound module contains two analog VCOs, three resonant analog filters, two envelope generators, and two analog VCAs. It can work as two parallel synthesizers with two different sounds, or as a single complex synthesizer with modulation. Breath and bite pressure can control pitch, pulse width modulation, filter cutoff modulation, and volume. The three different formant filters allow the creation of resonant formants for simulations of cups, mutes, plungers, and string body resonances. The External Input allows other sound sources to be processed through the EWV2000. Other features include wave envelope FM, 64 user programmable memories, and a 16-character backlit LCD. Additionally, the EWV2000 is equipped with a MIDI out jack. Besides being a two-oscillator analog synthesizer in its own right, the EWV2000 can transform analog control voltage to digital MIDI information to be sent to other MIDI-equipped devices such as synthesizers & samplers (Akai Professional n.d.a.)

Brecker used the CV to MIDI feature to control the Oberheim Matrix 12 synthesizer, Akai S1000 sampler, and various other outboard samplers, sound modules, and effects. He used separate Boss volume pedals for each sound source to quickly create and control different sound layers. It is notable that Joe Zawinul had used a similar “volume pedal per sound source” ideology in his setups since the mid 1970s. However, I could not determine whether Zawinul’s ideology and touring setup directly inspired Brecker’s vision, or if the influence came indirectly through

his technical collaborators. In the picture below, Brecker is captured during a sound check at the Free Jazz Festival Sao Paulo, Brazil on September 8, 1988, with a very similar touring setup to the Jazz Fest Wiesen a year later.



Photo 1. Michael Brecker, September 8, 1988. Sao Paulo. Photo: Susan Neustadt

3.5.3 “Gossip” [Live] EWI sounds

In the “Gossip” solo, Brecker used three different solo sounds. The following sound transcription is based on the available sound recording and equipment list deduced from photos like the one mentioned above. The first solo sound consists of three main components: 1) a sawtooth lead from an EWV2000 sound module or Matrix 12 analog synthesizer, 2) a Harmon muted trumpet sample from an Akai S1000 sampler or Prophet 2002 sampler, and 3) a pan flute sample from an Akai S1000 sampler or Prophet 2002 sampler. The second solo sound is a harmonizer patch only used for one phrase at the beginning of the second solo chorus (bars 18–19). I assume the constant structure harmony is created on the Matrix 12 by offsetting the oscillator pitches of individual voice cards’ (L0=input note) (-4) (-9) (-15) semitones. The third and last solo sound is Brecker’s take on the electric guitar lead sound. It is probably made with the Matrix 12 and outboard signal processing devices. Although on “Gossip” we can only hear a brief phrase of parallel harmonies, the same technology was used in other recordings and solos to create complex harmonies with an independent bass line. This so-called rotator feature was made on the Oberheim Matrix 12 (and its 6-voice rack-mount predecessor, Matrix Xpander). It allowed Brecker to play moving polyphonic chord progressions with the monophonic EWI. For example, two of the six-voice cards (voice cards 1 and 2) of the Xpander were triggered constantly, creating the input note (e.g., C4) and an interval that moves parallel to the input note (e.g., perfect fourth C4-G3). The remaining four voice cards had different oscillator coarse tunings, and were set to rotate in a sequence: voice card 3 D2 (-22 semitones from the input note C4), voice card 4 E2 (-20), voice card 5 F2 (-19), and voice card 6 Ab2 (-16). The result for C4 played four times would produce four different 3-voice chords: C4G3D2, C4G3E2, C4G3F2, and C4G3Ab2. The 12-voice Matrix 12 synthesizer consists of two Xpanders with a built-in keyboard, allowing even thicker static voicings and longer rotating sequences.

3.5.4 Solo Transcription

Gossip [Live]
EWI solo by Michael Brecker

♩ = 130 Funky stop time Mike Stern

Bars 1–4

The EWI solo begins with the band playing a unison stop-time vamp. No harmony accompaniment exists, but the vamp outlines an A13#9. A common technique for improvising in this kind of environment is to create a home base that serves as the tonic that rapidly alters between I7 (A7) and Im7 (Am7) and their closest scales. Another way to

approach the same musical situation is to make a compound dominant scale, where both thirds (M3, m3) are available simultaneously. In this case, the first four bars can be seen predominantly as A dominant diminished and, more specifically, a series of short approach figures leading to F#-major upper structure triad.

5

[A] [Dm] [Ebdim] [D] [A7] [Am7]

EWI

5 nt. 5 b3 nt. b3 5 1 pt. b3 b3 1 1 nt. 1 3 1 b7 1 3

Dm arp. pred. chromatic motif a motif b

Comp

A13(#9)

Bars 5–8

In bar 5, the line resolves briefly to the fifth of A7 and starts building a new tension arc at the end of bar 5 by introducing new signifying pitches (f, d) and suggesting possible superimposed chord changes in bars 5–6 over the A-pedal. A bluesy motif b that highlights the third at the end in bar 7 going to 8 brings us back to the home base.

9

[A7alt]

EWI

3 5 3 3

A minor pentatonic delta b A altered (Bb jazz minor 7. mode)

Comp

A13(#9)

Bars 9–10

Bar 9 features a rapid run of the A-minor pentatonic scale. The EWI has a feature called the octave roller that enables fast octave changes with the same fingering. Bar 10 has a balancing fast run-up. This time Brecker introduces a new sound, an altered scale.

11

[A7] [D] [A7]

EWI

1 b7 1 b7 1 1 1 1 1 1 1 1 1 3 1 b7 1 3

motif a' (intervallic change & augmented) motif b

Comp

A13(#9)

Bars 11–14

The line returns to the home base and A dominant sound. From bar 11, beat 4 features an augmented motif a' (doubled note values) where the first two notes are transposed a half step higher. These increase tension. Note D5 on the second beat of bar 13 serves as a plagal in-between stop before resolving back to the A7 home base with motif b displaced by a quarter-note.

Bars 15–16

The first half of bar 15 contains a motif typical to Brecker that combines a triad arpeggio with an added half-step to create a four-note pattern. The pattern can be used inside the dominant diminished scale as 1, b2, 3, 5 or 1, b3, 3, 5 or 1, 3, #4, 5, including all inversions and permutations. The figure is usually placed on beats. It is followed by an A-minor pentatonic and a hint to V7 (E7) before resolving to A-minor in bar 16 and A-major later.

2 **Half-time feel beat w/harmonizer** -----|

Ab/A Eb/E F/Gb Bb/B Ab/A F/Gb Eb/E F/Gb

Bars 17–20

The second chorus starts with a phrase that settles the home base. The rhythm consists mainly of quarter notes and eighth notes. In bars 18–19, the pentatonic lead line is harmonized with an applied diminished harmony voicing that consists of a second inversion major triad (with a third in the lead) on top of a bass note minor second above the triad's root (L0=input note) (-4) (-9) (-15) semitones. The break in bar 20 probably happens because Brecker needs to switch back to the unison solo sound.

Bars 21–24

Starting after the third downbeat of bar 21, a lengthy line of eighth notes in A-minor pentatonic turns into an A-blues scale in bar 23, anchoring the solo back to the basic groove and tonality. At the end of bar 24, the line builds

tension by switching into sixteenth notes (double time) and outlining a more distant G-minor chord on top of A ostinato.

Bars 25–26

One of the fundamental ways to achieve melodic chromatic lines is to superimpose tonal lines on top of foreign roots or chords, as many experienced jazz improvisers such as David Liebman have suggested. Based on the notes that fall on beats, I have marked my suggestions for possible chord substitutions. (In double-time phrases notated eighth notes behave like quarter notes.)

Bars 27–28

Here, the line builds chromatically towards a long rapid A(b5) downward arpeggio starting from the upbeat of beat 1 in bar 27. The home base of A-minor pentatonic is reinstated in bar 28.

Bars 29–32

These bars provide a landing spot for four bars that define the A-minor pentatonic tonality before the modulation. In bar 32, Brecker anticipates the forthcoming modulation and section change by playing the pickup on beats 3 and 4 already in F-minor 6th pentatonic.

drums follow the bass line

EWI 33 (F minor 6th pent.) [Fm7] F minor pen

Comp F Bb7 F Bb7

Bars 33–36

To begin the new section in the form, Brecker establishes an F-based home base over the bass and guitar riff. He stays in F-Dorian for over nine bars and alternates between F-minor 6th pentatonic and F-minor pentatonic scales. He also changes his EWI lead sound into a distorted guitar-like patch. His lines, phrasing, and nuances change accordingly towards string-like playing. This supports my main hypothesis that the synthesizer player must adjust their playing style in consideration of their instrument's character.

EWI 37 bend pattern 1 F minor 6th pent.

Comp F Bb7

Bars 37–38

Bar 37 introduces a very guitar-like fast triplet bending lick that is developed in bar 38 into a rapid phrase containing several successive bends. I believe that Brecker has adopted these patterns from guitarists such as Jimi Hendrix.

EWI 39 [Ab] 1 5 3 1 5 3 1 5 3 b3 1 b7 1 gva [Fm7] b7 b3 F Mixolydian

Comp F7 Bb7

Bars 39–40

In bar 39 the Ab-major triad arpeggio is utilized for a fast repetitive burst of notes that resolve into longer high notes in bar 40.

Bars 41–42

After many bars of rapid bursts of notes, Brecker nails down quarter notes and eighth notes of the basic time feel.

Bars 43–44

Bar 43 contains a chromatic passage. It can be interpreted as a long enclosure starting from D5 and leading to D5. Starting from the end of bar 43 Brecker outlines three triad arpeggios that are all inside the F Dorian scale. The first notes of the arpeggios create a polyrhythm of 3/8 inside 4/4 but are performed without any accent.

Bars 45–46

The line resolves into longer notes and the Fm6-arpeggio. Bars 46–47 contain a reprise of the rapid guitar-like bending pattern from bar 37.

4

(8)

EWI

47

Comp

F7

Bb7

[Gm]

b3

1 5 b3

Gm arp.

Bars 47-48

In bar 48, Brecker plays a pickup that anticipates the next key center of G-minor.

(8)

EWI

49

Comp

Gm7

A/G

Ab/G

Em/G

Eb/G

Em/G

Gm7

Gm pent.

Gm arp.

1 5 b3 1 5 b3 5 4 5 4 b3 1 5 b3 1 5 b3 1 5 b3 1

Bars 49-50

These two bars aim to establish the new key center and build energy through double-time rhythms and arpeggios. Harmonically, the line stays in G-minor pentatonic and G-minor triad arpeggios, although the comping harmonies contain chromatic upper-structure triad movement (Bb-A-Ab-Gb(F#) and Em-Eb over G-pedal). Becker does not underline these slash chords, but plays a horizontal line over the changes. Instead of an "outgoing" chromatic melody line, the comping provides the chromatic tension notes while the melody creates contrast by staying mostly inside the G-minor pentatonic.

EWI

51

Comp

A/G

Ab/G

F#/G

C7(sus4)/G

Eb/G

Em/G

Gm7

[Fsus4]

[Gm]

[Fsus4]

[Gm]

[Fsus4]

[Gm7]

[B]

[G]

[Gm]

5 4 1 5 b3 1 5 4 1 5 b3 1 5 4 1 5 b3 b7 5 b3 b7 5 b7 5 3 5 1 3 1 3 5

Fsus arp.

Gm arp.

Fsus arp.

Gm arp.

Fsus arp.

Bb arp.

B arp.

G arp.

pred. Gm arp.

Bars 51–52

In bar 51, the rhythmic intensity builds even more along the sixteenth-note triplets and arpeggiated G-minor and Fsus4 chords. Bar 52 has a short outgoing phrase that contains triad arpeggios B-major and G-major. This could hint towards Coltrane’s chord changes for “Giant Steps”, i.e. “Coltrane changes”, and the equal division of the cycle of fifths. The tension is released on the latter half of the bar by resolving the line back to G-minor.

53 *8va*

EWI

Comp

G minor pent.

Gm7 A/G Ab/G Em/G Eb/G Em/G Gm7

Bars 53–54

A new melodic arch starts with long notes in G-minor pentatonic.

55

Bendig in cycle of 5/16

EWI

Comp

(G minor pent.)

A/G Ab/G F#/G C7(sus4)/G Eb/G Em/G

Bars 55–56

A new rapid bending figure starts that can be seen as a variation of the previous bending figure (see bars 37, 45–47) transposed to G-minor. This time, the place of the sixteenth note triplet bend is rhythmically displaced in groups of five sixteenth notes. I have included an ossia staff for another option for notating the line.

57 (8)

(G minor pent.)

Comp

Gm7 A/G Ab/G Em/G Eb/G Em Em/F Em/F# Gm7

Bars 57–58

The double-time phrase continues with an alternating G-minor and Gsus4 triad arpeggio that repeats one note to achieve a four-note motif.

59 (8)

(G minor pent.)

Comp

A/G Ab/G F#/G C7(sus4)/G Eb/G Em/G B7(omit5)

Bars 59–60

These bars contain syncopated eight-note rhythms and an EWI feature that resembles an overblown tenor saxophone. Distortion is added to the signal and the interval of perfect 5th below lead becomes audible. Brecker also bends all attacks. This works as a high energy point of the phrase.

Bars 61–64

The overblown phrase resolves into a double-time phrase in G-minor pentatonic.

The slight exaggeration of the triplet feel in double time creates an Irish reel phrasing (like the beginning of “Itsbyenne Reel” on the Michael Brecker album *Don’t Try This at Home*).

3.5.5 Summary

The solo contains technical solutions that are much more complicated and advanced than in the previous solos. While the first three solos were played with one synthesizer (and some audio processing devices), Corea and Brecker used layered sounds from multiple synthesizers. This was possible due to the MIDI communication protocol and digital interface standardized in 1983. Synthesizers with a MIDI connection could be played and controlled by one synthesizer, defined as a “master”, while the others are “slaves” to it. In the “Gossip” [Live] solo, MIDI allowed Brecker to create rich layers of sounds where a separate synthesizer created each partial of the layer. In addition to the analog and FM syntheses found in the previous solos, Brecker also used PCM samplers as sound sources, where the waveforms were digital recordings of real instruments. He developed clever implementations of the rotator feature inherent to the Oberheim Xpander and Matrix 12 analog synthesizers, allowing him to play rotating or fixed parallel polyphonic harmonies with the monophonic EWI. Brecker’s sound sources had patch memories, allowing him to instantaneously recall different layered sounds with MIDI Program Change (#PC) commands. The music analysis reveals elements of tonal, modal, and chromatic jazz languages. The most noticeable

traits are his solid time feel, technical superiority, trademark phrases, and dramaturgical ability to craft an epic solo arch anytime he wanted.

3.5.6 Audio & Video Examples

3.5.6 Video 1 Stern, Mike. "Gossip." *Michael Brecker Band Live*

(EWI solo by Michael Brecker)

<https://youtu.be/z3DkbFTeAAI>

3.5.6 Video 2 Oscar, Visa. "Gossip"

(Michael Brecker's EWI solo imitation)

<https://youtu.be/aDbJHoBYRZw>

4 CONCLUSIONS

4.1 NEW POSSIBILITIES

At the beginning of the 1970s, synthesizers brought new expressive possibilities for keyboard players at a point when jazz as an art form was exploring new rhythmical and melodic-harmonic territories. In the explosive jazz-rock environment, synthesizers offered a way for single-note melodies to cut through the loud stage sound of large drum sets and amplified bass and guitars. On a piano, playing loud requires lots of short notes, excessive percussiveness, or thick polyphony. In addition, problematic issues such as microphone signal bleed and feedback, that concern all acoustic and semi-acoustic instruments, did not concern synthesizers. The possibility of sculpting a unique sound and new ways of nuancing the notes were significant attractions for players searching for individual expression and recognizable player identity. There were also contrary opinions and criticism, arguing that any player would sound the same on a synthesizer.

Perhaps due to the general zeitgeist of the 1970s, the paradigm of synthesizer soloing gravitated at first towards rock aesthetics and scale-driven modal playing instead of the hard-bop aesthetic of swung eighth notes and precise outlining of tonal harmony. There were some straight-ahead Minimoog solos (for example, Jan Hammer on Elvin Jones' records *Elvin Jones is "On a Mountain"*, 1975 and *Prime Element*, 1976, and John Abercrombie's *Timeless*, 1975) in the latter half of the 1970s. Still, their melodic-harmonic content was usually modal/chromatic, and their rhythmical approach was either up-tempo jazz or Latin; both of these situations enabled the soloists to play more even eighth notes. It took more than a decade (until the mid-1980s), and several technological advancements (FM-synthesis, keyboard velocity tracking, controller mapping) before the idiomatic jazz eighth note phrasing and precise outlining of the tonal harmonies (tonal jazz language) found their way into a jazz synthesizer solo.

The factors that contributed to the adaptation of synthesizers among jazz players were not just the "size and portability", as Thom Holmes suggested in his article (Holmes 2024), but the familiar organ keyboard, fixed signal chain, and the simple button layout. These features enabled intuitive experimentation with new sounds and the emulation of familiar acoustic instrument characteristics for musicians without deep expertise in music technology. The key reasons that the studied musicians used a synthesizer were the opportunities to create projecting sounds that were audible in a loud band environment, pitch manipulation (pitch bend, vibrato, fine tuning, coarse tuning), the possibility to create different sounds, and the possibility to alter solo sound's timbral qualities in real time.

Assuming a person has at least rudimental knowledge of an acoustic instrument, intuitive further experimentation happens naturally. A piano player does not need to know or think about the complex mechanics inside the piano. It is possible to experiment with the piano keyboard and hear the differences regardless. It is relatively easy to conclude how different ways of touch affect the sound. The early modular synthesizers did not offer this possibility, because they required the application of extensive knowledge of electronics before any sound was even made audible. When Moog introduced the monophonic non-touch reactive Minimoog with a fixed signal chain, the intuitive approach became somewhat possible again, if the player accepted that instead of touching the keyboard the alterations of timbre were made by changing the parameters of the synthesizer (i.e., twisting the knobs while

playing). On the other hand, this feature probably made some musicians think twice about engaging with the synthesizer.

For the most part, the synthesizer's role in jazz has been controversial. Still, many prominent jazz musicians have used it to add color or textures to the sonic picture. Some others have tried to approach the synthesizer like a piano and played any timbre in a jazz piano fashion. While the textural role fell somewhat naturally to the synthesizer, this study focused on musicians who developed a personal approach that featured the synthesizer as a primary solo voice in jazz. Qualities that unite the musicians in this research are high-level improvisation skills, a background in hard-bop groups, and an understanding of the tonal jazz language. As I conducted my study, it became evident that synthesizer improvising in a jazz context requires fluency in the rhythmic and melodic-harmonic languages of the jazz tradition, a solid sense of arranging for other instruments, and at least a rudimentary understanding of the synthesizer's technical functionality.

4.2 THE USE OF SYNTHESIZER IN THE ANALYZED SOLOS

When the basic oscillator waveform is revealed to the ear, the human psyche determines it to be uncanny or synthetic. In the synthesizer lingo, this is often referred to as "the sound dies." Therefore, minuscule variations should always happen in the pitch (notes, vibrato, pitch bend, pitch envelope) or the spectral range (timbre) of the sound (filter cutoff, resonance, filter envelope, filter modulation, oscillator sync, and various signal-processing devices).

As demonstrated in the analysis chapter, each player used several ways to keep the sound alive and interesting. In the "Celestial Terrestrial Commuters" solo, the fast LFO modulation in filter cutoff and Jan Hammer's guitar-like pitch bending serve to keep the sound alive. In the "Black Market" solo, Joe Zawinul uses constant LFO modulation of the oscillator fine tune and alters between the synthesizer line and Rhodes comping. In the "Brazilian Sugar" solo, George Duke uses micro bends, and vocal-like semi- and whole tone bends. In "Got A Match?", it is Chick Corea's velocity-sensitive layered FM sound together with pitch bending (ribbon controller) and LFO vibrato that do the trick. In the "Gossip" solo, Michael Brecker uses the EWI's sensors, rollers, and buttons to control multiple synthesizer parameters of several hardware synthesizers and samplers together with upward and downward pitch bending, LFO vibrato, different layered patches from patch memory, and a harmonizer.

The following tables summarize the background information, form analysis, interesting concepts and tools of jazz improvisation and qualities of the synthesizer sounds from the analysis chapter. The information is presented in a chronological order from left to right from the oldest recording to the newest recording. It is essential to emphasize that this layout does not reflect any personal preference. In my opinion, all the selected solos contain great improvisation, and they sound marvelous. I aimed to demonstrate how great solos can be when crafted by utilizing various elements and approaches.

Table 1 summarizes the essential background information regarding the analyzed transcriptions.

Table 1					
Song Title	"Celestial Terrestrial Commuters"	"Black Market "	"Brazilian Sugar"	"Got A Match?"	"Gossip" [Live]
Composer	John McLaughlin	Joe Zawinul	George Duke	Chick Corea	Mike Stern
Album Title	Birds of Fire	8:30	A Brazilian Love Affair	Chick Corea Electric Band	Michael Brecker Band Live
Record Label and Original Publishing Year	Columbia/CBS, 1973	ARC/Columbia, 1979	Epic, 1980	GRP Records, 1986	ITM-Media/Jazz Door, 1993
Recorded in	August 1972	November 1978-January 1979	March 1979-April 1979	1986	July 1989
Song tempo	q=216 BPM	q=120 BPM	q=200 BPM	q=300 BPM	q=130 BPM
Time Signature	19/8 (ostinato: 3/4+3/4+7/8) or drums: 4/2+3/8)	4/4	2/2	4/4	4/4
Rhythmic Feel	Funk, compound time, even eights	Soul/RnB beat, even eights	Jazz Samba (teleco-teco) alla breve, even eights	Half-time feel funk and straight-ahead uptempo jazz	Stop-time, half-time feel beat, funk beat, even eights

According to Table 1, Zawinul, Duke, and Corea are improvising on their own compositions, while Hammer and Brecker are improvising on a song by their fellow band members. Four solos are from a record published by a major record label. Gossip [Live] was published on an unofficial bootleg album. Individual songs from the Wiesen Jazz Festival 1989 concert can be found as videos on YouTube, but often without mentioning the performers and recording artists. "Celestial Terrestrial Commuters" is in a composite time while others are 4/4 or alla breve. The most common time feel is funk/soul backbeat, which aligns well with the stereotypical jazz fusion paradigm. "Brazilian Sugar" is a jazz samba, a style that emerged in the early 1970s to the jazz fusion scene after the success of Chick Corea's albums *Return to Forever* and *Light As A Feather*. "Got A Match?" expertly blends half-time feel-funk with uptempo jazz, featuring a synthesizer solo rooted in straight-ahead style. This combination underlines Corea's strong ties to the earlier hard-bop era. The stop-time feel at the beginning of the "Gossip [Live]" solo highlights Michael Brecker's exceptional sense of timing, as the overall momentum during the first third of the solo relies heavily on him. This approach also poses a challenge to listeners who may not be well-acquainted with jazz and its conventions.

Table 2 summarizes the form and tension arch of the solos.

Table 2					
Song Title	"Celestial Terrestrial Commuters"	"Black Market "	"Brazilian Sugar"	"Got A Match?"	"Gossip" [Live]
Solo Form	1 x 11 bar chorus	2 x 16 bar chorus + 10 bars	2 x 36 bar (20+8+8) form	5 x 16 bar chorus	1 x 64 bar (32+16+16) form
Solo Arch Climax Area in	bars 8-9 (of 11)	bars 37-38 (of 42)	bars 25-28 and 67-69 (of 72)	bars 58-68 (of 80)	bars 47-57 (of 64)
Golden Ratio Point in	Bar 7	Bar 26	Bar 44 (bar 22 of each chorus)	Bar 50	Bar 40

According to Table 2, all solos reach a single climax area shortly after the golden ratio (approximately 0.618/1), except for "Brazilian Sugar," which features two climax areas before the end of each chorus, both occurring slightly beyond the golden ratio point for each chorus.

Table 3 summarizes the interesting concepts and tools of jazz improvisation.

Table 3					
Song Title	"Celestial Terrestrial Commuters"	"Black Market "	"Brazilian Sugar"	"Got A Match?"	"Gossip" [Live]
Tonal Jazz Language	5,9 %	22,8 %	5,6 %	86 %	38,3 %
Modal Jazz Language	87,1 %	67 %	94,4 %	4,4 %	50,3 %
Chromatic Jazz Language	7 %	10,1 %	0 %	9,6 %	11,4 %
Improvisational Language	Predominantly modal jazz language	Tonal and modal jazz languages	Predominantly modal jazz language	Predominantly tonal jazz language	Combination of tonal, modal and chromatic jazz languages
Solo Orchestration	Single note line	Single note line	Single note line	Single note line	Single note line and parallel polyphony
Notable Characteristics	Odd meter rhythm motifs in 3/8, 5/8 and 7/8, string-like pitch bending	Indigenous "naive" melodies, interpersonal and intrapersonal communication, morphing from modal to tonal jazz language	Compositional motif development, singable melodic lines	Fluent tonal jazz language with rhythmic authority, melodic cell shifting	Lines based on upper structures, motif development, melodic patterns, melodic cells, fast runs, repetition
Scales	Minor and major pentatonic scales, the 2nd mode of the Jazz minor scale	Major pentatonic scales, modes of the Major scale symmetric scale.	Minor pentatonic scales, modes	Modes of the Jazz minor scale, minor pentatonic scales, blues scale, chromatic scale	Minor pentatonic scales, Minor six pentatonic scale, modes of the Jazz minor, blues scale, chromatic scale, symmetric scales
Scale Usage	Predominantly one scale per chord	Common denominator pentatonic scales and one scale per chord	Common denominator pentatonic scales and modes	One scale per chord	Multiple scales per chord
Comping	No	Alternating between comping on both hands and only left hand comping under the solo line	No	No	No
Hand Position	Right hand on the keybed, left hand on the pitch bend	Right hand on the ARP2600 and left hand on the Rhodes or both hands on the Rhodes	Right hand on the keybed, left hand on the pitch bend	Right hand on the keybed, left hand on the keytar handle for the ribbon and modulation lever	Both hands on the EWI keys and controls

The percentage for tonal, modal, and chromatic languages was calculated by counting all the sounding noteheads from the transcriptions and distributing them into either category according to the analysis. If the notes were analyzed to reflect the underlying chord changes, they were categorized as tonal language. If the notes were analyzed to form a scale closest to the underlying chord, or the notes of the analyzed scale (or chord) were also found from the closest scale, they were categorized as modal language. If the notes were analyzed to reflect chord changes that were superimposed on top of the original chords or chords that the rhythm section was playing, or they formed a scale that reflected another chord than the underlying chord, they were categorized as chromatic language.

Table 4 summarizes the synthesizer sounds of the solos.

Table 4					
Song Title	“Celestial Terrestrial Commuters”	“Black Market “	“Brazilian Sugar”	“Got A Match?”	“Gossip” [Live]
Sound Character	Resonant, string-like	Ethnic woodwind	Snappy square wave	Electric piano & brassy synth lead layer	1) Sawtooth lead/ pan flute/harmon mute trumpet layer 2) similar to 1 but sawtooth harmonized with a constant structure 3) distorted guitar emulation
Sound Source	Moog Minimoog Model D	ARP2600	Moog Minimoog Model D	Yamaha TX816	Akai EWI1000 & EWV2000/Oberheim Matrix12/ Akai S1000/Sequential Prophet 2002
Synthesis Method	Analog, subtractive	Analog, subtractive	Analog, subtractive	Frequency Modulation (FM), additive	Analog, FM, sample playback, combination of subtractive and additive
Polyphony	1 (monophonic)	2 (paraphonic)	1 (monophonic)	16 (polyphonic)	Unknown but operated mostly in mono mode
Realtime Controllers	Keyboard, pitch bend	Keyboard, volume pedals (audio)	Keyboard, pitch bend	Keyboard, key velocity response, ribbon controller (for pitch), modulation lever	Touch-sensitive switches, air pressure sensor, lip pressure sensor, octave rollers, pitch bend sensor, glide sensor, and volume pedals (audio)

The first three solos use a single sound character, while the latter two feature layered sounds. The main innovations leading to layered sounds were MIDI, patch memory, increased polyphony, and multitimbral sound sources. Brecker is the only one who uses several different sounds in his solo.

According to these tables, Jan Hammer and George Duke have similar approaches. They both use the Minimoog and play single-note lines mostly on their right hand while the left hand is operating the pitch bend. However, their aesthetics for the sound character and bending are different. Hammer has a wet and resonant sawtooth wave sound and bends like a string-instrument player, while Duke’s hollow square wave sound has a snappy attack and bends more like a singer or a horn player. They both use predominantly modal jazz language, but while Hammer uses one scale per chord approach, Duke plays through several chord changes with a common denominator scale (minor pentatonic) included in each chord’s closest scale¹⁷ (mode).

Joe Zawinul is the only one who changes between soloist and comping roles during the solo. He also uses his left hand to accompany the Rhodes electric piano simultaneously while playing the synthesizer with his right hand. As both hands are on the keys, the only real-time controllers he can use are the volume pedals (with his feet). Although the volume pedals have no role in this solo, generally, they are an essential part of Zawinul’s playing, especially during the post Weather Report-era, when he managed many sound characters with his massive multi-keyboard setup and custom-made MIDI router and combined them ad hoc with volume pedals. Zawinul also uses

¹⁷ For example, he uses E-minor pentatonic to play in the key of E-minor through Cmaj7 (C-Lydian), Am7 (A-Dorian), Em7 (E-Aeolian), and Fmaj7 (F-Lydian). Each of these scales contains the notes of E-minor pentatonic.

a common denominator scale approach throughout the first sixteen bars of the solo. The notes of the B-major pentatonic scale can be found from the closest scales for the IIm7 (C#m7 and C#-Dorian) and I6/9 (B6/9 and B-Ionian). Later, he morphs into tonal jazz language and one scale-per-chord approach.

Chick Corea uses a hand layout similar to that of Hammer and Duke in “Got A Match?” but his instrument hangs from a shoulder strap on his side. Corea uses predominantly tonal jazz language in his solo, and his sound is layered, containing FM electric piano and brassy synthesizer sounds. He can control several parameters with the keyboard velocity: A softer key press produces a smoother sound, while a stronger one produces a brighter sound. This feature dramatically benefits the idiomatic jazz eighth-note phrasing, a noticeable feature of this solo.

Michael Brecker’s approach stands out from the rest for obvious reasons. His controller was the Akai EWI, which features touch-sensitive switches in a saxophone button layout. Behind the instrument keys, it has pitch-bend and glide sensors for the right thumb and octave rollers for the left thumb. In addition to that, the mouthpiece detects air pressure and lip pressure. All these controllers can be routed to various destinations in the accompanying sound module (analog synthesizer EWV2000) or translated to MIDI and sent to external synthesizers and sound modules. Suppose a standard keyboard synthesizer player has three real-time controllers (a keyboard, pitch bend, and modulation wheel), but to operate the wheels, he/she must sacrifice the left hand. Meanwhile, the standard EWI player has six real-time controllers, all of which he/she can operate without compromising the normal playing position or hand layout. This feature, combined with Brecker's dexterity in his jazz expression that utilizes three major jazz languages and meticulous R&D work with his technical collaborators, resulted in a very expressive jazz synthesizer performance.

4.3 KEY ELEMENTS OF AN EXPRESSIVE SOLO SOUND

According to the studied musicians' interviews, analyzed transcriptions, and my experience as a jazz synthesizer improviser, the critical features of an expressive solo sound for jazz improvisation are responsiveness (low latency), projection in a band situation, ability to control crucial parameters (volume, pitch bend, vibrato, amplifier attack, filter cutoff, reverb, delay) intuitively in real-time, wide playable range, and predictable behavior in different ranges. An expressive solo sound enables various kinds of phrasing, dynamics, and idiomatic basic, double-time, and quadruple-time feels. On a keyboard controller, idiomatic jazz eighth note phrasing usually requires keyboard velocity tracking modulating the amp level and the filter cutoff. However, it can be imitated on an older non-touch reactive mono synth by playing lower register ghost notes with the left hand while the keyboard filter tracking is on (the cutoff is lower for lower notes). For me, the best solution for achieving idiomatic jazz eighth note phrasing on a synthesizer is to play the notes on a keyboard (with pitch bend and modulation wheel) and modulate the filter cutoff and amplifier level with a breath controller for dynamics and articulation.

4.4 PRESENT DAY CHALLENGES

Despite their sophisticated sound generation capabilities, modern synthesizers are remarkably user-friendly. They can be used in a "coloring role" in the studio and on the go, requiring only basic keyboard skills and a minimal learning curve. This accessibility makes them attractive to beginners and those who play synthesizers as a secondary instrument. Advanced sound design and programming skills are no longer mandatory since modern devices come pre-loaded with presets covering a wide range of sounds and genres. This has undoubtedly contributed to the synthesizer's popularity in today's music scene.

Thousands of hardware manufacturers and software developers are producing instruments replicating the most sought-after vintage classics or utilizing some fresh innovation. The instruments vary from expensive handmade boutique designs to cost-efficient mass production units, from significant music software houses to private entrepreneurs. Although instruments usually focus on one synthesis method or a particular design philosophy on a single device level, their easy availability in all price categories guarantees that a synthesizer player can easily equip themselves with all standard synthesis methods and sounds regardless of the budget (this was certainly not the case during the studied period 1972–89 when the cost of a single synthesizer could be worth a car). The present-day spectrum of synthesizers (samplers included) covers sound characteristics from ultra-realistic imitations of acoustic instruments and vintage keyboards to futuristic sonic experiments. This brings forward the present-day synthesizer player's most extensive opportunities and challenges. Amid all this abundance, losing oneself in endless browsing of available sounds is far too easy. Therefore, the present situation demands a solid insight from the player – the ability to imagine, find, and program sounds that provide the essential elements discussed in the previous chapter.

In jazz music, the lead synthesizer player assumes the role of a soloist, wielding an influence akin to that of a vocalist, lead horn player, or lead guitarist. Their task involves shouldering expressive responsibilities and leaving

a notable imprint on the sonic spectrum of the song. The lead synthesizer line is expected to possess melodic allure and rhythmic engagement. Each note must converse on the micro-level with the rhythm section, employing the distinct vocabulary of traditional jazz languages.

Traditional jazz instruments already have a long history of how their features and possibilities are utilized in jazz expression. Several generations of innovative players have experimented, expanded, and thus defined the possibilities and limitations of the typical instruments in jazz. However, these players have always been tied to the sound characteristics of a single instrument. A synthesizer player is an arranger who can choose from various sound characteristics. At best, this is a tremendous source of inspiration and provides unique opportunities to seize the moment.

In most cases, playing a synthesizer in a band requires making preparations in advance. The sounds, recalled from a patch memory or programmed live, must be curated and learned thoroughly beforehand. Hence, the player knows exactly how the chosen sound must be approached, how it behaves, and where its strengths and weaknesses lie. Unpreparedness seldom leads to inspiring situations. To pick a random sound and turn an improvised solo into an open experimentation process is only possible for the most experienced players.

Another critical dimension is the equipment, "the rig", which combines real-time controllers, sound sources, and signal-processing devices. In the earliest example discussed in this thesis ("Celestial Terrestrial Commuters" solo by Jan Hammer, 1972), the equipment consisted of only a single Minimoog synthesizer. During the seventeen-years covered here, the "expressive ecosystems" developed, side-by-side with the overall technical advancements, into complex installments of analog and digital synthesizers, PCM samplers, and effect units connected with MIDI, such as the one Michael Brecker used for his EWI solo in 1989. The equipment must be thoughtfully planned and thoroughly learned to invite the player to constantly interact with the synthesizer sound in real-time, keeping the sound inspiring, exciting, and alive. This thesis presents five unique styles of the jazz language and five "expressive ecosystems" that have significantly shaped the lead jazz synthesizer paradigm. I hope they inspire the present and future lead synthesizer players to challenge and develop their own musical insight and equipment.

4.5 SUGGESTIONS FOR FUTURE RESEARCH

The field of artistic research in jazz synthesizer improvisation remains a largely uncharted domain, presenting a rich tapestry of artistic research potential yet to be fully explored. In this thesis, I have presented five approaches to jazz synthesizer improvisation by centering around the contributions of five jazz musicians at the forefront of this evolving genre during its early stages. During my doctoral studies, I studied their solos, compositions, and songs frequently performed by them by planning, preparing, rehearsing, and performing for 75-90 min. doctoral concerts during the years 2013-2016. The transcriptions and supplementary materials amassed for these concerts have also formed a repository of research material for the thesis. I selected five solos from this collection for intensive analysis. This over-a-decade-long imitation-assimilation-innovation framework significantly enriched my perspective as a jazz artist. This transformative journey culminated in making my second album, *Visa Oscar: "Looking Back, Reaching Forward."*

Each musician analyzed in this study embodies a unique improvisational style that calls for its thorough investigation. For instance, Chick Corea's extensive recorded oeuvre presents vast opportunities for artistic research. Similarly, the innovative uses of synthesizers by prominent figures such as Pat Metheny and Herbie Hancock call for a deeper dive into their creative processes. Their works and personas could also be researched from cultural and historical viewpoints.

Additionally, the emergence of younger musicians such as Larry Williams, Jim Beard, Scott Kinsey, Seamus Blake, Julian Pollack, Nicholas Semrad, and Cory Henry provides a moment for comparative analysis. Investigating the improvisational styles of these second and third-generation jazz synthesizer players against their first-generation predecessors could yield insights into shared qualities and the evolution of jazz synthesizer practices.

While this thesis presents many foundational elements of jazz synthesizer soloing, some advancements have unfolded since the 1990s. The primary focus of the studied musicians was on subtractive analog synthesis, with Corea employing additive FM synthesis and Brecker integrating both along with PCM samplers. Since then, technological innovations have introduced new synthesis methods (such as physical modeling, resynthesis, and granular synthesis) and several interesting controllers that employ the vastly enhanced MIDI Polyphonic Expression (MPE) (such as Haken Audio the Continuum Fingerboard, Roli Seaboard, Linnstrument and Expressive E Osmose.) An intriguing way for further artistic jazz synthesizer research would be to delve deeply into these innovations, rigorously exploring their possible applications for expressive jazz improvisation.

APPENDIX

ARTISTIC COMPONENTS

Visa Oscar Plays the Electric Fusion Jazz of Chick Corea, 2013

Helsinki Music Center, Black Box, March 22, 2013

Line-Up

Visa Oscar, keyboards

Joonatan Rautio, saxophones

Saku Mattila, guitar

Juho Kivivuori, bass

Jussi Lehtonen, drums

Set list (All compositions by Chick Corea)

Got A Match?

- Chick Corea Elektric Band, Chick Corea Elektric Band, GRP Records, 1986
- Sheet music published by Not Bernie's Publishing Co
- Additional transcriptions by the author containing drum set during the theme
- Soundalike backing track by the author

Sea Journey

- Chick Corea, *Piano Improvisations Vol. 1*, ECM, 1971. Originally entitled "A Song for Sally"
- New arrangement for band based on published sheet music for solo piano.

Beyond the Seventh Galaxy

- Return to Forever, *Where Have I Known You Before*, Polydor, 1974.
- Transcribed score

Nite Sprite

- Chick Corea, *The Leprechaun*, Polydor, 1976
- Transcribed score

Children's Songs No. 3

- Chick Corea, *Children's Songs*, ECM, 1984
- Sheet music published by B. Schott's Söhne. Mainz
- Performed on Rhodes Mark V electric piano instead of an acoustic piano

Children's Songs No. 20

- Chick Corea, *Children's Songs*, ECM, 1984
- Sheet music published by B. Schott's Söhne. Mainz
- Performed on Rhodes Mark V electric piano instead of an acoustic piano

King Cockroach

- Chick Corea Elektric Band, *Chick Corea Elektric Band*, GRP Records, 1986
- Sheet music published by Not Bernie's Publishing Co
- Additional transcriptions by author containing bass lines and drum set during the theme
- Soundalike rehearsal backing track by the author

Hopscotch

- Warner Bros instructional VHS video entitled *Chick Corea – Electric Workshop* (Warner Bros, 1988)
- Transcribed lead sheet. The included booklet contains a published lead sheet for Hopscotch, but it was not at my disposal.

T.B.C. (Terminal Baggage Claim)

- Chick Corea Akoustic Band, *Chick Corea Akoustic Band*, GRP Records, 1989
- Lead sheet from New Real Book II
- Additional arranging considering the form and the soprano sax part by the author
- Backing track for practicing

Final Frontier

- Chick Corea Elektric Band II, *Paint the World*, GRP Records, 1993
- Transcribed lead sheet

Space

- Chick Corea Elektric Band II, *Paint the World*, GRP Records, 1993
- Transcribed score

Tone Poem

- Chick Corea Elektric Band II, *Paint the World*, GRP Records, 1993
- Transcribed score

Appendix Video 1 Oscar, Visa et al. "Children's Songs No. 20 & Nite Sprite"

<https://www.youtube.com/watch?v=dVOyUakecqq>

Unleashing the Innovations Behind Michael Brecker's EWI, 2014

Helsinki Music Center, Black Box, May 6, 2014

Line-Up

Visa Oscar, keyboards

Joonatan Rautio, saxophones

Saku Mattila, guitar

Vesa Ojaniemi, bass

Jussi Lehtonen, drums

Set list

Song for Barry (Michael Brecker)

- The Brecker Brothers, *Return of The Brecker Brothers*, GRP, 1992
- Transcribed score

Oops (Mike Mainieri)

- Steps Ahead, *Live in Tokyo 1986*, NYC Records, 1994
- Transcribed score

Ode to the Doo Da Day (Jim Beard)

- Michael Brecker, *Now You See It... (Now You Don't)*, GRP, 1990
- Lead sheet and parts published in *New Real Book II*

Talking to Myself (Don Grolnick)

- Michael Brecker, *Don't Try This at Home*, Impulse, 1988
- Transcribed score

Suspone (Mike Stern)

- Michael Brecker, *Don't Try This At Home*, Impulse, 1988
- Transcribed lead sheet

Original Ray's (Michael Brecker)

- Michael Brecker, *Michael Brecker*, Impulse, 1987
- Transcribed score

Some Skunk Funk (Randy Brecker)

- The Brecker Brothers, *The Brecker Bros.*, Arista, 1975
- Transcribed score

Note: our version is mostly from a DVD -version:

RETURN OF THE BRECKER BROTHERS - LIVE IN BARCELONA, GRP, 1992

Song for Bilbao (Pat Metheny)

- Michael Brecker, *Tales From The Hudson*, Impulse, 1996
- Transcribed lead sheet

Appendix Video 2 Oscar, Visa et al. "Original Ray's"

<https://www.youtube.com/watch?v=BpyhnmhRV0k>

Joe Zawinul's Improvisational Concept and Its Legacy, 2015

Helsinki Music Center, Black Box, May 28, 2015

Line-Up

Visa Oscar, keyboards, vocoder

Joonatan Rautio, saxophones

Vesa Ojaniemi, bass

Ricardo Padilla, percussion, vocals

Jussi Lehtonen, drums

Visitors:

Janne Halonen, guitar, vocals

Noël Saizonou, percussion, vocals

Set list

Introduction To a Mighty Theme (Joe Zawinul)

- Joe Zawinul, *My People*, ESC Records, 1996
- Transcribed lead sheet
- Synthesizer solo performance

Corner Pocket (Joe Zawinul)

- Weather Report, *Sportin' Life*, Columbia, 1985
- Transcribed score

Palladium (Wayne Shorter)

- Weather Report, *Heavy Weather*, Columbia, 1977
- Lead sheet and bass part published in *The World's Greatest Fake Book*
- Supporting keyboard part transcriptions

Camieff (Jim Beard)

- Jim Beard, *Song Of The Sun*, CTI Records, 1991
- Score and parts from the author

Waraya (Salif Keita)

- Joe Zawinul, *My People*, ESC Records, 1996
- Transcribed lead sheet
- My arrangement combines some melodic motives and solo form from Chick Corea's "Space" that shares the same bass riff in a different key.
- With visitors

Dream Clock (Joe Zawinul)

- Weather Report, *Night Passage*, ARC Columbia, 1980
- Transcribed lead sheet

Young and Fine (Joe Zawinul)

- Weather Report, *Mr. Gone*, ARC Columbia, 1978
- Lead sheet published in published in *The World's Greatest Fake Book*
- Supporting keyboard part transcriptions

Directions/Dr. Honoris Causa (Joe Zawinul)

- Weather Report, *Live & Unreleased*, Columbia-Legacy, 2002
- Transcribed score

Black Market (Joe Zawinul)

- Weather Report, *8:30*, ARC Columbia, 1979
- Transcribed score

Patriots (Joe Zawinul)

- Joe Zawinul & The Zawinul Syndicate, *World Tour*, ESC Records, 1998
- Transcribed score
- With visitors

Appendix VIDEO 3 Oscar, Visa et al. "Directions/Dr. Honoris Causa"

<https://www.youtube.com/watch?v=1ErpLpGd-4w>

The Role of Synthesizer in a Jazz Fusion Ensemble, 2016

Helsinki Music Center, Black Box, April 21, 2016

Line-Up

Visa Oscar, keyboards

Joonatan Rautio, saxophones

Saku Mattila, guitar

Vesa Ojaniemi, bass

Jussi Lehtonen, drums

Set list

Miles Beyond (John McLaughlin)

- Mahavishnu Orchestra, *Birds Of Fire*, Columbia, 1973
- Score published by Warner-Tamerlane Publishing Corp. & Chinmoy Music Inc., 1973 & 1976
- It's a great opening track. It starts with an open tanpura (tambura) -drone and leads the audience and the band into the world of Mahavishnu and his guru Sri Chinmoy.

Cobra (George Duke)

- Miles Davis, *Amandla*, Warner Bros, 1989
- Transcribed score
- Harmonically a bit different tune than most of Duke's originals. It has a sense of bitonality since the bass riff is clearly outlining E-minor, but the keyboard riff suggests D-minor. Mostly all soloists land on D-minor on their solos. I decided to feature the original drum programming as a sample loop in our version. As we play with a sequenced bass line the bass player can double the melody lines.

Coming Back Home (Jan Hammer)

- Tony Williams, *The Joy of Flying*, Columbia, 1979
- Transcribed sax, piano & bass parts
- Slightly different song form and melodic-harmonic content than in most Hammer's originals.

- I wanted to maintain most of the original simplicity, but I wanted to do a slight reharmonization when the theme repeats. Since the song is in 3/4, I also wanted to embed a flamenco rhythm in 12 called bulerías into the solo vamp backgrounds. The original solo vamp harmonies suggest scales that are typical for bulerías.

Festival (George Duke)

- George Duke, *Follow the Rainbow*, Epic, 1979
- Lead sheet published in *The World's Greatest Fake Book*
- New arrangement score & parts by the author
- Trademark sound of Duke from 70's to 80's -a funky samba. After trying to play the song as is, I decided to rearrange the song to fit our lineup and repertoire a bit better. I ended up with a more jazz fusion than Latin version that utilizes mostly original harmonies. The B-part was changed the most as I took the original vocal melody ideas and arranged them into new chord hits and bass line. We also included the original unison hits into the sax solo vamp. That idea came from my drummer Jussi Lehtonen in the band rehearsals.

You Know, You Know (John McLaughlin)

- Mahavishnu Orchestra and John McLaughlin, *Inner Mounting Flame*, Columbia, 1971
- Transcribed lead sheet / Score published by Warner-Tamerlane Publishing Corp. & Chinmoy Music Inc., 1973 & 1976
- This song has such a great meditative mood that it serves as a great oasis of peace in the middle of energetic jazz fusion. The challenge of this song is in how the phrases are related to the meter. For the concert, I wrote my own lead sheet because I felt strongly against the logic of the published sheet music version at the time. Looking back, I realize that the published version was probably more right than I was. Anyway, this detail really challenged the band to listen and pay attention.

Love Reborn (George Duke)

- George Duke, *Brazilian Love Affair*, Epic, 1979
- Lead sheet published in *The World's Greatest Fake Book*
- In the heart of the soulful "singing" synth playing style of George Duke. A smooth 16-beat version of a track that was first released on a Flora Purim -record as a Latin -style song. Most guys don't dare to do this, but George Duke is all in.

Brazilian Sugar (George Duke)

- George Duke, *Brazilian Love Affair*, Epic, 1979
- Transcribed score
- Originally a more samba/telecoteco -song that I wanted to slow down and turn into a more sensitive Bossanova to give more time for the pretty chord changes and the melody.

Celestial Terrestrial Commuters

- Mahavishnu Orchestra, *Birds of Fire*, Columbia, 1973
- Score published by Warner-Tamerlane Publishing Corp. & Chinmoy Music Inc., 1973 & 1976 / Transcribed score
- A stellar performance from the whole group. A rare time signature is woven together by a clever riff and a melody that is from the blues/rock -domain. The published score deviates from the recording at times and therefore I ended up transcribing the score from the recording. Jan Hammer masters the odd time signature fluently in his solo. This synth solo is the one of the corner stones of the guitar-like synth soloing language.

Vital Transformation

- Mahavishnu Orchestra and John McLaughlin, *Inner Mounting Flame*, Columbia, 1971
- Score published by Warner-Tamerlane Publishing Corp. & Chinmoy Music Inc., 1973 & 1976
- Another McLaughlin trademark: A driving rock riff in an uncommon time signature leads into B-section that is dominated by symmetric harmony relations and melody sequences. A trademark that was truly unique in the early 1970's jazz rock-scene. I did a small arrangement for the last riff and the synth solo that introduces Weather Report's "Black Market" riff in 9/8.

Red Baron (Billy Cobham)

- Billy Cobham, *Spectrum*, Atlantic, 1973
- Transcribed score
- This is a good "everybody" encore. Laid back groove and a simple head with a polyrhythmic quirk.
- Original recording features Jan Hammer's trademark "Rhodes piano through a ring modulator" -solo.

Appendix VIDEO 4 Oscar, Visa et al. "Celestial Terrestrial Commuters"

<https://www.youtube.com/watch?v=cAD2YAuwXXI>

Audio Recording

EAN: DIGITAL: 196589248817

[CD: 6430060552210]

Catalog Number: DIGITAL: G010004843981M

[CD: FIVOM02]

Release Date: 17.06.2022

Recording Year 2020 & 2021, Finland, United States of America, Brazil

Artist: Visa Oscar

Album: Looking Back, Reaching Forward

Formats: Digital download, streaming

Genre: jazz fusion

Record Label: Sibis Jazz

Publication series: Sibis Jazz Doc

Distributor: Sony Music Entertainment Finland Oy

Recorded by: Miikka Huttunen, Jere Harjunniemi and Tinji Vuori @ Finnvox Studios, Helsinki

Recorded by: Visa Oscar @ OMP Studios, Helsinki

#01 Drums recorded by Dave Weckl; bass recorded by Carlitos Del Puerto.

#02 Saxophone recorded by Ville Vannemaa; bass recorded by Antti Ahoniemi;
additional keys recorded by Jukka Backlund.

#03 Drums recorded by Rafael Barata; bass recorded by Andre Vasconcellos,
vocals recorded by Eeppi Ursin.

#04 Bass recorded by Antti Ahoniemi.

#05 Percussions recorded by Ricardo Padilla.

#07 Percussions recorded by Ricardo Padilla; saxophone recorded by Joonatan Rautio.

Mixed & mastered by: Tommi Vainikainen/Master Fader Labs

Produced by: Visa Oscar/Oscar Music Production Ltd Oy

Photo by: Maciej Sójka/Soyka Photography

Cover art design by: Jarkko Heiniö/Kivi Paperi Sakset

Copyright: Oscar Music Production Ltd Oy All Rights Reserved 2022

Endorsements:

Visa Oscar plays TEControl breath & bite controller 2

Carlitos Del Puerto plays Fodera basses and strings and Gallien-Krueger amplifiers

Dave Weckl plays Yamaha drums, Sabian cymbals, Remo drumheads and Vic Firth drumsticks

Rafael Barata plays Tama drums, Zildjian cymbals, Remo drumheads, Vic Firth drumsticks and

LP percussion

Track List

Note: All tracks are original compositions by Visa Oscar and are unpublished (manus). However, musicians were credited 5% of copyrights as composing credits for a track and 10% if the track included an improvised solo.

#01 Armando's Flamenco (Album Version) 06:07 ISRC: FIVOM2200001

(Composer: Visa Oscar, Ville Vannemaa, Carlitos Del Puerto, David Weckl)

sax: Ville Vannemaa, bass: Carlitos Del Puerto, drs: Dave Weckl, keys: Visa Oscar

#02 Asymmetric Lovesong (Album Version) 06:14 ISRC: FIVOM2200002

(Composer: Visa Oscar, Ville Vannemaa, Antti Ahoniemi, Jussi Lehtonen)

sax: Ville Vannemaa, bass: Antti Ahoniemi, drs: Jussi Lehtonen, additional keys: Jukka Backlund,

keys: Visa Oscar

#03 Bossamba (Album Version) 06:16 ISRC: FIVOM2200003

(Composer: Visa Oscar, Eeppi Ursin, Andre Vasconcellos, Rafael Barata)

voc: Eeppi Ursin, bass: Andre Vasconcellos, drs: Rafael Barata, keys: Visa Oscar

#04 Nocturnal Confessions (Album Version) 06:55 ISRC: FIVOM2200004

(Composer: Visa Oscar, Ville Vannemaa, Antti Ahoniemi, Jussi Lehtonen)

sax: Ville Vannemaa, bass: Antti Ahoniemi, drs: Jussi Lehtonen, keys: Visa Oscar

#05 Another Waltz (Album Version) 05:38 ISRC: FIVOM2200005

(Composer: Visa Oscar, Ville Vannemaa, Antti Ahoniemi, Jussi Lehtonen, Ricardo Padilla)

sax: Ville Vannemaa, bass: Antti Ahoniemi, drs: Jussi Lehtonen, perc: Ricardo Padilla, keys: Visa Oscar

#06 Chromatic Rhythm (Album Version) 06:26 ISRC: FIVOM2200006

(Composer: Visa Oscar, Ville Vannemaa, Antti Ahoniemi, Jussi Lehtonen)

sax: Ville Vannemaa, bass: Antti Ahoniemi, drs: Jussi Lehtonen, keys: Visa Oscar

#07 The Door of No Return (Album Version) 07:26 ISRC: FIVOM2200007

(Composer: Visa Oscar, Joonatan Rautio, Antti Ahoniemi, Jussi Lehtonen, Ricardo Padilla)

sax: Joonatan Rautio, bass: Antti Ahoniemi, drs: Jussi Lehtonen, perc: Ricardo Padilla, keys: Visa Oscar

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This thesis investigates jazz synthesizer improvisation by analyzing five recorded solos: “Celestial Terrestrial Commuters” (Birds of Fire), “Black Market” (8:30), “Brazilian Sugar” (Brazilian Love Affair), “Got A Match?” (Chick Corea Electric Band), and “Gossip” (Michael Brecker Band Live). The research employs an artistic practice-based methodology, emphasizing self-learning through aural imitation and music theory analysis. The author transcribed and analyzed synthesizer solos from the original recordings. The source material includes four doctoral concerts, audio recordings, videos, books, scholarly articles, magazine articles, and online sources. Key findings indicate that successful jazz synthesizer soloing relies on mastering the improvisational languages of jazz and adapting one’s playing style to the unique acoustic characteristics of each sound.

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