Competing Epistemologies of Tuning, Intonation and Melody in the Performance of Thai Classical Music on Non-Fixed-Pitch Instruments

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Differences between Thai fixed-pitch and non-fixed-pitch musical practice have been described, but there has been no accepted explanation of these differences in relation to the accepted Thai tuning theory. This theory maintains that the Thai scale is equidistant, but it was not formulated to explain the practices and concepts of musicians who sing or play non-fixed-pitch instruments. The absence of an explanation for these practices is attributed to the tendency among scholars to accept assumptions about tuning that were developed for European rather than Thai music. This article is relevant to Southeast Asian studies as it deals with the problem of imported extrinsic theory displacing indigenous explanatory models.

**Keywords:** Thai music, tuning, intonation, equidistance, Thailand, practitioner knowledge.

It is widely known by Thai classical musicians that performers who sing or play non-fixed-pitch (NFP) instruments do not share the same concepts and practices of pitch and melodic expression as those who play fixed-pitch instruments (Manop 2016, pp. 17–18). Differences in the melodic qualities of these two groups are recognized as basic traits of performance by Thai musicians, and they are “easily perceived by the ear” (Morton 1974, p. 90). These differences are largely because of different approaches to what is typically described in English as ‘tuning’. For Thais, it is axiomatic that the *piphat* ensemble, which comprises fixed-pitch-percussion (FPP) instruments,
and the khrueang sai ensemble, which comprises NFP instruments, have different structural constraints that predetermine the character of their respective ‘systems’ and the scope of their flexibility. These have direct practical implications for the sounds the instruments make and their melodic possibilities, which lead to different concepts of tuning and intonation for the musicians associated with these two groups of instruments and their respective ensembles. These differences are part of a broader categorical distinction made between the ensembles, which involves different, though not entirely separate, repertoires and progression through the ritualistic dimension of musical life, resulting in musicians identifying as either piphat or khrueang sai musicians.

Despite widespread awareness by Thai musicians of distinctive intonational concepts and practices, their existence and causes are largely unexplained in English. Consequently, the practices of NFP performers have been swept up in the general orthodox theory of Thai tuning that sees Thai music as based on the seven-way geometrically equidistant division of the octave—a process that is supposed to produce an equidistant scale made up of intervals of 171.429 cents.\(^1\) Thus, the epistemology that has come to dominate discussions about Thai tuning derives from a set of assumptions about music that are relevant to music with very different properties and historical dependencies. The accepted theory, which has been the sole explanation of Thai tuning, is typically interpreted as denoting geometric equidistance. But actual tests on instruments have continually failed to find evidence to support the theory. And, as will be discussed here, Thai musicians are well aware that within Thai music (dontri thai) there are multiple tuning concepts and practices of ‘tuning’; none of which is equidistant according to the meaning attributed to ‘equidistance’ in Thai tuning theory. Belief that the orthodox theory is comprehensive has overshadowed NFP practices and forestalled the emergence of any formal acknowledgement of tuning differences between fixed-pitch and non-fixed-pitch performance. Accordingly, English-language explanations of Thai tuning have been limited to a single epistemological and narrative thread. Notwithstanding the evidence that contradicts equidistance, there are important questions about
the legitimacy of explaining the variety of Thai tuning practices through a single mathematically derived process that was developed to explain Thai tuned percussion. Terry Miller observed that “any discussion of equidistance and nonequidistance concerns only certain members of the Thai instrumentarium” (2008, p. 141). This recognition of disparate practice goes some way to explaining the easily perceived differences between performance practices and ensembles, but this has not prompted a call to action. In this discussion, I hope to address this gap as well as doubts arising out of a lack of correspondence between the theory and the musical practice it is supposed to describe.

There are two main points to be made here. One is to provide an account of NFP performance. By explicitly acknowledging NFP performance practices and the complex thinking involved, a more complete picture of Thai tuning emerges. The other is to survey the factors that have stood in the way of an explanation of these concepts and practices.

A number of Thai musicians were consulted in the course of this research. And while their views do not amount to a definitive or comprehensive explanation of Thai tuning, they provide insight into the diversity of tuning concepts and practices in circulation. Their explanations show that established practices of explaining Thai tuning through numerical descriptions of its supposed equidistant properties reduces the complexity of Thai melody to a theoretical abstraction that fails to consider how musicians play and think about music. Their insights give another view of Thai tuning, which may provoke a shift in how tuning is discussed in the English language literature. It is hoped that by describing established and well-known melodic concepts and practices adopted by NFP performers, in addition to the theoretical propositions underpinning them, a clearer picture of Thai musical thought will emerge.

Background

The idea that the principles of musical tuning can be expressed in numerical terms stems from the Greek, Chinese and European
traditions of employing mathematical formulas to systematically calculate ways to divide the octave (see Barbour 1951, pp. 1–15). The most historically important early systematic approach to tuning is attributed to Pythagoras (Barbour 1951, p. 1). In that system, pentatonic and heptatonic scales are created through the calculation of intervals based on the simple integer ratio of 3:2, which are stacked to give scales that comprise pure fifths. This approach entails a significant limitation, however, as the process of stacking simple integer ratios creates problems that make it unsuitable for the twelve-way division of the octave. This process was thus unable to fulfill the growing need of European composers for a twelve-note chromatic scale that would enable modulation through all twelve major and minor keys (Barbour 1951, p. 2). The solution to this was the development of the twelve-tone equal-tempered (12-tet) tuning system, the defining property of which is its geometrically equidistant scale, in which adjacent notes are proportionally equally spaced. This system, developed after much historical experimentation, allowed composers to modulate to all major and minor keys. The system of 12-tet tuning became the standard in Europe. Whilst there are exceptions, such as when singers and instrumentalists make slight adjustments to their pitch to optimize harmonic/melodic effect, these are nominal deviations from a standardized tuning practice.

The idea that Thai music is based on the equidistant division of the octave came from Alexander Ellis in 1885 in a publication considered a cornerstone in the development of comparative musicology (Ellis 1885, pp. 485–527). Using his own new formula, he theorized that the ideal Thai interval was the result of the geometrically proportional seven-way division of the octave, which yields an interval of 171.429 cents. This idea has been uncritically accepted in English language scholarship since Ellis (see Garzoli 2015, pp. 1–8), sustaining the belief that Thai tuning, and thus Thai melody, is reducible to an abstract theoretical proposition and its mathematical expression. The willingness to accept his idea stems from the belief that because mathematical formulas were used to create tuning systems in Europe, they must also be the basis of
other tuning systems (Schneider 1991, p. 297), even if there was no direct evidence or any other reason to believe that mathematics played a part in their formulation.

It is worth recalling the origins of the introduction of European concepts into the Thai semantic and conceptual world because of the role they played in forestalling the circulation of Thai concepts. Although Western ideas about music were in circulation among visitors to Siam from the early twentieth century (see Graham 1913, p. 459), explicitly European ideas about music had not yet penetrated the cloistered world of Thai musical thought, either in the court or among private musicians. There are some cases—such as the ensemble known as piphat duekdamban, which reflects attempts to borrow from European opera traditions—but in general, Thai musical thinking stood apart from the European intellectual tradition of formal music theorizing, and it was largely indifferent towards it. The crucial step of bridging these two worlds occurred at a presentation given by Western-trained musician Phra Chen Duriyanga at the Siam Society in Bangkok on 22 August 1947. During this presentation, he described the properties of the Thai scale in the systematic terms used to describe 12-tet. Phra Chen declared that “the Siamese musical scale is equally divided within its octave into seven degrees of seven full tones equidistant as regards the different pitches” (1948, p. 21). To illustrate his point, he presented a graphic illustration of the Thai and Western tuning systems on two staves (Phra Chen 1948, p. 22).

By presenting the two ‘systems’ in a way that enabled their side-by-side comparison, he forged the impression that Thai tuning could be presented as if it had set and stable interval properties and that this characteristic could be contrasted with corresponding characteristics in European tuning. From this moment, analytical ideas suited to European music were drawn into the Thai musical world, where they gained acceptance within the traditional Thai musical knowledge system. The presentation set off a chain reaction as it instigated the normative process of explaining Thai music through European musical terms and conceptual frameworks to an accepting
Thai audience. The graphic was first published by the Department of Fine Arts (Krom sinlapakon) in the edited transcript of the 1947 presentation that appeared the following year. In the period since its initial presentation, the illustration has become a defining symbol in the tuning orthodoxy of Thai music theory and a staple of tuning discourse in Thai publications. Following its initial publication, it was reproduced alongside explanatory notes, also written by Phra Chen, in the first fully notated European style scores of Thai music. These were the Homrong yen (Evening Overture) suite, published in London by J. Thibouville-Lamy & Co. in 1950, and Tham khwan (Overture Invoking Spiritual Bliss) published in Thailand by the Department of Fine Arts in 1954. These scores were subsequently republished by Mahidol University in 1994 (Sujit and Phra Chen 1994a, p. 25; 1994b, p. 25) and they remain in circulation. The graphic appeared in each of the three volumes on Thai music commemorating the golden jubilee of the reign of King Bhumibol Adulyadej by the Department of Fine Arts in 1996 (Department of Fine Arts 1996a, p. 8; 1996b, p. 8; 1996c, p. 8). It has since made its way into the scholarly literature, where it or a slightly modified version is routinely exhibited as the primary explanatory model of
Thai tuning (see Pheerasut, Sunee and Tasawan 2013, p. 233; Sugree et al. 1997, p. 27; Panya 1999, p. 66; Morton 1976, p. 26). There is little doubt about Phra Chen’s historical importance. But Thai musicians are aware that he did not train in Thai music and that, by his own admission, he had limited knowledge of it (Phra Chen 1948, p. 1). Consequently, they do not take his statements about Thai music as authoritatively as others may.

The idea that Thai music is equidistant has become entrenched in English language scholarship on Thai music through David Morton, the first and most influential English language author on Thai music, who agrees with Ellis (Morton 1976, pp. 22–29; 1975, pp. 90–93). The influence of Morton’s work on English language Thai music scholarship is difficult to overstate, as discussions of Thai music seem incomplete without mention of his reflection on Thai tuning and the numerical representation of its interval. Equidistance has also been accepted by Thai scholars (Kittiphong, Rudeerat and Sarawut 2004, p. 1; Boonchuay 1995; Sugree et al. 1997, p. 10) and in disciplines specifically concerned with mathematical representation of tuning (Rahn 2019, pp. 1–6; Strumolo 2007; Sethares 2005, pp. 303–13). For some scholars in these fields, Ellis and Morton are presumed to be the authorities and their ideas veridical.

Scholarly Doubt over Equidistance

Despite there being no evidence that mathematics played a role in the historical development of Thai tuning, numerous scholars have embraced a quantitative epistemology and have attempted to show the basis of the tuning through empirical tests of individual instruments. Far from confirming the theory, tests have consistently cast doubt over it, and by association its epistemology. Studies by Kittiphong, Rudeerat and Sarawut (2004, p. 5), Dusadee (2003, pp. 23–30), Somchai (1973, unnumbered abstract, p. 53) and Garzoli (2015, pp. 20–21) that involved tests of real instruments and singers show that neither NFP performances nor the bars and gongs of FPP instruments that the theory was formulated to describe are tuned to
the specifications laid out in the theory. The most comprehensive of these quantitative studies was conducted by engineer Somchai Thayarnyong (1973). After testing hundreds of instruments, he concluded that Thai tuning is not equidistant because “[n]one of Thai instruments [sic] are tuned to the equal tempered scale [7-tet]” (1973, p. 58). This lack of agreement between theory and practice should come as no surprise in light of the factors that have been discussed at length by John Garzoli (2015, pp. 10–15; see also Anant 2003, pp. 445–53). Included in this list is the irrelevance of the theoretical interval (171.429 cents) to those who tune the instruments and—even if it was their goal—the impracticality of attaining this interval because of the way the instruments are tuned.3

Among some specialists, the theory is treated with dubiousness. Manop (2016, p. 17), Miller (2008, p. 40), Dusadee (2003, pp. 27–32), Panya (1999, p. 64), Bussakorn (1997, pp. vi–vii) and Myers-Moro (1993, p. 31) have all expressed doubt over its veracity. Theoretical confusion over tuning is characterized in the observation by Thai scholar Manop Wisuttipat that “although the precision in tuning of Thai music may be scientifically questionable, Thai musicians maintain that one octave is divided into seven equidistant tones” (2016, p. 17).

The Theoretical Blind Spot

The absence of explicit recognition of any differences between the tuning of fixed-pitch and NFP performance has led to a corresponding absence of any perceived need to formulate a theory for NFP performance. This has stymied thinking about the intonational practices associated with NFP performance and curtailed theoretical explanations of differences in how tuning and intonation work in different instrument and ensemble contexts. The most far reaching consequence of this condition is that it denies the possibility that melodic expression that is clearly outside of 7-tet can be attributed to anything other than ornaments, embellishments, or deviations from the established theoretical scale, as exemplified by fixed-pitched-
percussion. This may explain why Miller (2008, pp. 140–41) and Panya (1999, p. 64) did not consider notes outside of the theorized scale to be structurally significant or part of a legitimate tuning system. Similarly, Burns and Morton did not consider the intonational variation of Thai singers as comprising a separate species of performance practice to be interpreted in reference to established conventions of Thai singing (thang rong). Burns interpreted the intonational variability of singers as deviations from “an equally tempered seven-interval scale” (1999, p. 247), and Morton explained a singer’s pitch variation as deviations from a precisely tuned xylophone known as the ranat, which he took to be the reference for correct pitch (1974, pp. 89–90).

These interpretations can be understood in the context of the historical development of the discipline of ethnomusicology, which was formerly characterized by a comparative ethos. During this period, the discipline was firmly committed to the notion that objective scientific methods were the primary medium through which to understand tuning. Later ethnomusicologists—recapitulating ongoing discussions in anthropology (see Handler 1997, pp. 71–80)—reflected critically upon their assumptions and methods. This led to important questions about the place of concepts and terms developed for the study of European music in the study of music that is not part of that tradition. A deeper and more culturally responsive understanding of music could be attained by attempting to understand music in terms that reflected ideas that circulated at the source of creation. These changes, which were ethical as much as methodological, drove ethnomusicological thought and practice away from positivist and comparative methodologies towards efforts to understand music as it is understood by practitioners. One of the questions raised was about the wisdom of attempting to use science to explain humanistic problems (Schneider 1991, pp. 293–305).

But what continues to circulate and be believed about Thai tuning is a throwback to this earlier epistemology. This suggests that discussions about Thai music remain rooted in a period before what Rice called the “interpretive turn” (2010, p. 104) and the suite of
disciplinary developments that have shaped modern ethnomusicology.\textsuperscript{4} The most glaring oversight is the absence of the Thai performers’ voice in discourse about Thai tuning. By not considering how musicians think about melody, discussions of Thai tuning are in an intellectual cul-de-sac where the perpetuation of the orthodox theory contradicts a fundamental anthropological ethos. This was expressed by Bruno Nettl, who pointed to “the (now laughably obvious) idea that one should find out how the members of a host society think about and analyze their music” (Nettl 2010, p. 62); by Michael Tenzer, who argues that “Music is so important; what scholars write about it should be at least close to the truth as its creators see it” (2011, p. 79); and by Nicholas Cook, who claims that “there is no objective domain independent of local interpretation” (2012, p. 197). In contemporary musicology, the absence of insights by Thai musicians into their own practice is not only ethically unsound but it also almost certainly guarantees flawed understandings given the distance between Thai musical thought and the epistemological assumptions that underpinned the formulation of tuning theory.

The fundamental disparity between extrinsic theory and practice was illustrated in a discussion I had with instrument tuner Banharm Palo while he was tuning the instruments at the Luang Pradit Pairoh Foundation for a special performance. He scoffed at the idea that the instruments should be tuned to a standardized set of predetermined intervals. As with other tuners, he dismissed the scholarly insistence on equidistance as irrelevant, and he pointed out that factors including the unreliable nature of the human ear, the capricious nature of human preferences, the conditions under which instruments are used and stored and their susceptibility to unpredictable change make such a goal unfeasible.\textsuperscript{5}

Scale

The dominance of Western theoretical and analytical modes of thought has seen scholars of Thai music take the methods used in the analysis of Western music and the philosophical values that underwrite them
as normative. So, when the theory was developed in isolation from Thai musical practice and practitioners, it was based on a range of etic assumptions extrinsic to Thai music. Perhaps the most significant of these is the tacit assumption that a musical tradition has a single homogenous approach to its tuning practices. This makes perfect sense from the European perspective, from which the possibility there may be a number of established tuning concepts circulating within a single musical tradition does not arise. But European-derived ideas about tuning and Thai explanatory models occupy parallel universes of musical thought. Circulating within these two universes are concepts and terminologies that are axiomatic in their home context but which have no directly corresponding counterpart in the other. This is most obvious in the lack of correspondence between their technical terms used to describe tuning.

Typifying the normative use of the abstract European concepts in descriptions of Thai music is the unquestioned use of the term ‘scale’. Although there is no historically established Thai musical term that has the same meaning (Myers-Moro 1993, pp. 84–85; Morton 1976, p. 115), the term has nonetheless taken hold in English language literature (Manop 2016, p. 17; Strumolo 2007, p. 2; Sethares 2005, p. vi; Dusadee 2003, p. 26; Burns 1999, p. 247; Panya 1999, p. 64; Boonchuay 1995; Phra Chen 1982, p. 57; 1951, p. 7; 1948, p. 22; Somchai 1973; Morton 1970, pp. 6–7). The Thai terms *bandai siang* (sound ladder), *rabop siang* (overall sound system) and *thang* (when used to indicate the principle note of the mode in which a song or melodic section is performed) come closest to the European scale idea, but the concepts are not mutually interchangeable.6 The European concept presupposes a set of notes with predetermined positions. Ethnomusicologists Arom and Fürniss argued that the scale “manifests itself as a mental representation, in the middle of which the degrees of the scale occupy fixed, predetermined positions” (1992, p. 171). This abstract concept has become a master category into which all practices of melodic expression are thought to fit. However closely the Thai terms come to conveying a similar meaning, none of them is conceptually synonymous or implies that Thai melodies
are made up of intervals with predetermined proportions. The danger in accepting this framework is that in specifying precise pitches, the process overlooks the primary factor in determining the pitches, which is the melodic context.⁷ The abstract mental representation of a scale described by Arom and Fürniss does not arise in Thai music because there are no fixed notes with predetermined positions in either absolute or relative terms. To apply this concept to Thai music requires decoupling the concept of pitch from melody and fabricating a set of notes with fixed and definable properties that are comparable to the Western scale, the properties of which serve as an objective reference against which the Thai scale can be measured.

A similar issue arises with the concept of a ‘note’. In contrast to European music, in which the relatively fixed nature of the tuning system entails a correlation between notes and frequency (A4 = 440 Hz), there is no such relationship between notes and frequency in Thai music. Historically, music was taught through onomatopoeic terms that were used to indicate hand movements for percussion instruments or indicate finger placements on string and wind instruments. Notes did not have ‘names’ in the abstract. It was only with the relatively recent introduction of the solfege system by scholars such as Manop Wisuttipat (2016, p. 20) that the bars and gongs of tuned percussion and finger placements on chordophones or aerophones were given names. Miller and Sam-Ang noted that despite the lack of a developed and understood theoretical terminology, “discussions in Western languages (and in Thai and Khmer to some extent) often refer to pitches by letter names as if everyone understands” (1995, p. 237). More than thirty years later, it has been my experience that even where there is understanding, there can be no certainty that what is understood from various perspectives is the same mutually shared idea.

Thai Concepts and Terms

At the heart of the confusion is a lack of consensus over what ‘equidistance’ means, which is the key term and concept here. In
English language discussions, ‘equidistance’ is assumed to have a quasi-scientific meaning. This assignment leads to empirical measurements and numerical explanations of tuning properties. From this perspective, it makes sense to accept that the Thai scale comprises seven equally spaced intervals of 171.429 cents. Phra Chen’s illustration gave the misleading impression that Thai tuning was equidistant and homogenous; there are, however, numerous other concepts, practices and theories in circulation.

While the English language concepts of ‘equidistance’, ‘note’ and ‘scale’ have made room for themselves in discussions about Thai music, the crucial Thai terms and their relationship to their supposed English counterparts are not well understood. Bringing the discussion closer to the Thai musical world involves considering relevant Thai terms. The crucial term when describing Thai tuning is jet siang thao (literally, seven sounds equal), which is understood as seven sounds about the same distance apart. The semantic field covered by this and other terms used in discussions about tuning may overlap in important ways, but they cannot be seamlessly conflated with English concepts. In this instance, the English meaning of ‘equidistant’ is empirically denotative, while the Thai interpretation of the term is connotative. The origins of jet siang thao have not been fully established, but it is probable that the concept was introduced by revered Thai musician and scholar Montri Tramote, who used it in the lessons he taught at the Department of Fine Arts in 1938. His Thai language book Khambanyai wicha duriyangkhasat thai (Explanation of the Subject of Thai Music) (Montri 2002, p. 27) states that the Thai musical arrangement (riang siang) comprises seven sounds (jet siang), the frequencies of which are separated equally (thao thao kan) until the eighth note (Montri 1992, p. 27). The key word in the phrase is thao, which implies a relationship between things of similar quality, quantity or location. In this case, it indicates that Thai intervals are ‘about’ the same size. As indicated earlier, the literal English translation of jet siang thao is ‘seven equal sounds’. But this does not mean that the intervals are precisely distributed in a way that corresponds to what equidistant means in 12-tet tuning.
There are two main schools of thought relating to the concept of *jet siang thao*. One sees it as the primary explanation of Thai tuning, and thus applicable to all Thai performance. The other, dissenting view, considers the concept of *jet siang thao* to be a partial explanation that applies only to fixed-pitch instruments of the *piphat* ensemble. These two understandings of *jet siang thao* have been the source of some tension between those who endorse the traditional knowledge system and its explanations and those who argue that Thai music requires a more nuanced and comprehensive explanation of its melodic and tuning practices. This distinction has not registered in English language scholarship, and neither the term *jet siang thao* nor a discussion of its conceptual development has made its way into the writings of English language scholars. Confusion over terminology is compounded by the fact that ‘equidistant’ has been used to refer to finger placement for string players, which according to Somchai does not produce “any type of scale at all” (Somchai 1973, p. 10). From my discussions, *jet siang thao* is a heuristic concept that is linked to two other qualifying terms used when discussing tuning. The first is *chalia*, which means ‘a rough average’, while the second is *uppraman*, which means ‘metaphorical’. When Thai tuning is understood in these terms, the theoretical problems that arise when attempting to explain the inherent melodic diversity in Thai performance vanish because the metaphorical (*uppraman*) and heuristic nature of *jet siang thao* enable all Thai tuning to be imagined as falling within its orbit.

Thai Melodic Practice

The heterophonic texture of Thai music allows each melodic line to follow its own path (*thang*) (Garzoli and Bussakorn 2018, pp. 8–13). In creating these melodies, NFP performance entails the skills to exercise discretionary control over pitch, which enables performers to shape their melodic quality. By the nature of their performance, string players, flute players and singers shape their intonation to achieve the appropriate melodic quality. Whatever difference there may be between individual performers, their practice is underpinned
by the shared fundamental trait of being shaped by the skill and subjective preferences of the performers, who are “responsible” (Anant 2003, p. 452) for the intonation qualities of their melodies. This is a defining characteristic of non-fixed pitch performance practice; this skill is not required of fixed-pitch performers because the pitch of their instruments is not influenced by their skill or judgment as a performer. Herein lies the most basic distinction between fixed and non-fixed performance practice that sets them apart and leads to the two groups having fundamentally different phenomenological and conceptual relationships with pitch and the concept of intonation. The differences between ensembles and their instruments are routinely addressed in Thai pedagogy, which reinforces the notion of the stylistic expression of melody. These ideas have also made their way into Thai-authored books and articles that theorize tuning concepts that explicitly contradict equidistance (see Tharanat 2019, pp. 151–54; Jarun and Kittiphong 2013, pp. 1–6; Dusadee 2003, pp. 30–32; Worayot 1998, pp. 6–12).

As with the non-standardized concept of tuning, non-fixed performers have developed a variety of approaches to melodic practices. Competent performers do not simply perform melodies as if they comprised predetermined steps in a scale, but shape the melodic quality according to well-established aesthetic ideals specifically associated with NFP performance. Repertoire, personal style and ensemble type all influence intonation. Intonational flexibility is an inherent property of NFP performance. It arises naturally in the absence of the constraints present in harmonic music. As a defining characteristic of NFP performance, it is symbolic of the creative licence enjoyed by those performers. But it is a trait not easily accommodated within the Western analytical perspective as that mode of understanding is conditioned to dealing with melodies that are limited in advance to notes derived from a fixed set with known properties.

The ability to shape melodic quality to suit a particular repertoire is most pronounced in performance of the samniang (accent) and thang (melodic path/style). Samniang involves performing in what are known as the musical ‘accents’ of a number of other countries (Myers-
Moro 1993, pp. 73–81). In describing the intonational characteristics of *samnian*, a study by Jarun and Kittiphong shows that *khlui* players produce the desired melodic quality of each *samnian* by changing the intervallic relations in the melodies. This leads to variations between intervals within a single *samnian* and between the corresponding intervals in the seven *samnian* they considered (2013, p. 11). It is telling that in seeking to explain the various *samnian*, this study, co-authored by respected Thai university associate professor and wind instrument performer Jarun Kanchanapradit, does not begin from the assumption that the orthodox tuning theory is correct. Rather, it begins from the observation—which for Thai musicians is profoundly obvious—that “some Thai tunes do not sound right to the musicians when played with the idealistic [7-tet] sound system” (Jaran and Kittiphong, 2013, p. 7). Thus, in attempting to explain contextual factors that shape intervallic variation, their study presupposes an axiom that contradicted the equidistant theory.

Intonation is also influenced through the concept of *thang*, which lies at the heart of Thai musical thought. In normal usage, *thang* means ‘path’ or ‘way’. As a musical term, it has numerous related meanings (Garzoli and Bussakorn, 2018, pp. 10–13). Relevant here is its use in relation to the stylistic idiom associated with different instruments (*thang khrueang*) and singers (*thang rong*), and in its use to describe the musical style of an individual or one associated with a school and its original teacher. The flexibility inherent in *thang khrueang* and *thang rong* enables musicians to adjust their melodic qualities in different ensemble types. For example, when NFP performers participate in *piphat* ensemble, they generally calibrate their intonation to match those instruments, but when they perform *phleng diao* (solo repertoire) or in *khrueang sai* ensembles, their intonation is not constrained by fixed-pitch instruments and they are free to produce their favoured melodic quality without reference to fixed pitch instruments. When singers perform with *piphat*, they are not accompanied by FPP instruments, but rather they alternate with them (*rong rap*). Consequently, they do not need to match their melodic quality to the fixed-pitch percussion.
This relative estrangement from tuned percussion does not imply a lack of precision in their practice. Bruce Gaston, who is a founding member of Fong Naam, recalled their rehearsals in the 1980s, during which he observed Jaroenchai Soonthornwatin, the most revered singer of the twentieth century, coaching her younger understudy Nattawipa Moonthamken.\(^\text{12}\) Khru Jaroenchai’s training of Nattawipa was exacting in its intonational precision. The goal of the coaching was not, however, to bring it into alignment with the percussion instruments, but to refine her skill in a melodic quality that was related to Jaroenchai’s \textit{thang rong}.

The concept of \textit{thang} as an expression of personal style is synonymous with the performer’s capacity to shape their melodic quality. In this regard, musicians refer to an ideal sound called \textit{siang nai udomkhati}. This is often \textit{thang khru} (teacher’s style), which is held in their aural imagination as a model of perfection. To achieve their ideal sound, musicians perform with what is known as \textit{phithi phithan} (meticulous attention to detail). These terms may relate to both fixed and non-fixed pitch performances, but in NFP the expression of personal \textit{thang} and \textit{thang khru} through the concepts of \textit{siang nai udomkhati} and \textit{phithi phithan} involves techniques related to the control of intonation that apply solely to NFP performers.

\textbf{Siang Thammachat, Pythagorean Tuning and Microtonal Intonation}

As well-known as the practical and conceptual differences between instruments and ensembles are, there is no historically established practice of explicitly theorizing them. Thai musicians may be as indifferent to fully articulated tuning theories as musicians from any other tradition. As with performers elsewhere, Thai musicians are expected to accept knowledge transmitted by the teacher, so fidelity to the pedagogy precludes interrogating tuning theory. There are, however, musicians who have felt a need to clarify aspects of their practice, and in doing so have proposed their own theories of tuning. Some of these theories contradict the orthodox theory implicitly, while some do so more explicitly. Two of the
most prominent exponents of alternative tuning concepts are highly regarded string player Worayot Suksaichon (discussed below) and Lerkiat Mahavinchaimontri, who is a musician at the Department of Fine Arts, a teacher at Chulalongkorn University, a member of the acclaimed Fong Naam and Korphai ensembles and one of the most respected and influential string players of his generation.

In our discussions about tuning, Lerkiat expressed dissatisfaction with the principle of equidistance and the interval of 171.429 cents, which he characterized as an academic fabrication that was developed in isolation from the actual sound of Thai music and the ideas that inform its performance. He and Worayot consider its circulation in English and its permeation into the Thai knowledge system as the perpetuation of a falsehood. For them, the theory is incapable of accounting for the diversity and richness of Thai melodic practice because it reduces it to mechanistic terms that overlook the complexity of NFP practice. Their criticism includes the concept of jet siang thao, which, through its specification of seven notes, relates to fixed-pitch instruments but not to string players. In order to address the problems they see in the manner Thai tuning is being discussed, they have proposed alternative theories intended to clarify the categorical distinction between fixed-pitch and NFP performance, and to describe the latter’s performance practices more accurately.

Among string players, a well-known ideal in the production of sound is the concept of siang thammachat (natural sound) (Worayot 1998, p. 5), which relates to both timbre and intonation. In relation to intonation, siang thammachat can be thought of as a way of playing that reflects the naturally occurring harmonic overtone series. Melodies based on this concept of tuning differ from those produced in Thai equidistance because the two theoretical concepts share no notes. While siang thammachat may not typically be thought about in terms of tuning theory, for Lerkiat, the relationship between the concept of siang thammachat and Pythagorean principles of tuning has clear theoretical implications. Whether theorized explicitly or not, the ideal of siang thammachat has direct implications for tuning because the open strings of the saw duang and saw u, which
are the two-string upright fiddles, are not tuned to the theoretical Thai fifth (685.7 cents), as suggested by Morton (1974, p. 90), but are tuned to the harmonic fifth interval (702 cents). Similarly, the strings of \textit{saw sam sai}, which is the three-string upright fiddle, are tuned more closely to the harmonic fourth (498 cents) than to the theoretical Thai fourth (514.3 cents). The preference of the musicians for these intervals may be influenced by the prevalence of the naturally occurring harmonic fifth, which is a prominent frequency in the sound of the low string on the \textit{saw duang} and \textit{saw u}. By connecting \textit{siang thammachat} to Pythagorean tuning, string players have an acoustical justification for the crucial phenomenological distinction they make between small and large adjacent intervals (similar to the tone and semi-tone intervals of 12-tet), which are part of Pythagorean tuning but not the Thai theory.

Although these differences are well-known to musicians, some were reluctant to dwell on them in our discussions. They expressed discomfort at theories addressing diversity of practice and concepts because the explicit recognition of these ideas risks creating the unwanted impression that Thai music is not a holistic system. This included concerns that Thai music is fundamentally misrepresented when extrinsic systems of classification are applied to it because they are based on, and produce, categorical distinctions not recognized by Thais. From this perspective, the Thai indigenous concept of \textit{jet siang thao} does not require validation through processes brought from outside the Thai knowledge system. For musicians who embrace this idea, the structurally disparate variations that exist in the tuning of fixed-pitch instruments, whether systematic or incidental, and the intonational diversity of NFP melody inherent to Thai music do not contradict \textit{jet siang thao}.

Worayot’s Theory

The most well-known proponent of alternative theoretical explanations of tuning for NFP performance has been Worayot Suksaichon. He is a highly regarded string musician and teacher and, like Lerkiat,
a former member of both Fong Naam and its forerunner the celebrated ‘Siamese Music Ensemble’ (known in Thai as Ketkhong damrong sin). He published his theory of melodic practice, tuning and intonation in 1998 in a Thai language book, Trisadi siang dontri thai (Theory of the Sound of Thai Music). In it he explicitly calls attention to important differences in the tuning of fixed-pitch and NFP instruments by specifically describing disparities between string players, who have the capacity and licence to control pitch (Worayot 1998, p. 9), and fixed-pitch instrumentalist, who do not (1998, p. 3). In doing this, he makes clear the link between melodic context and intonation. This is followed by two significant claims. The first is that Thai string playing, which is underpinned by the aesthetic concept of siang thammachat, comprises three different sizes of intervals between adjacent melodic notes (Worayot 1998, pp. 3–5). The largest, called “hang-kwa”, is wider than the Western tone. The intermediate size, which he calls “chitkan”, is narrower than the Western tone (p. 3). And the smallest, which he calls “mai dai chitkan”, is narrower than the Western semi-tone (p. 5). The second claim, and the core philosophy of Worayot’s practice, is that the Thai melodic system includes a total of seventeen discreet notes (p. 11). Worayot indicates these sounds in the Thai notation system by adding symbols above the notes in the heptatonic notation system. As indicated in Figure 2, Worayot uses a + (plus) symbol to indicate that a note is siang sung (sound above), which means sharp, and a − (minus) symbol to indicate that a note is siang tam (sound below), or flat. Notes without a symbol are called siang klang (middle sound). Worayot does not attempt to specify the intervallic distribution of his system in numerical terms because the pitch of each note varies according to melodic context.

He demonstrates this in his notation of the melody Thayoi nai sam chan (Thayoi Melody in Third Rhythmic Level; see Figure 2). The extract shows that the melody comprises notes with the + and − symbols as well as siang klang, which are all other notes without additional notation. In this song, the note ฟ (fa) has three sounds and is to be played in all three positions.
Worayot’s views are considered radical for contradicting orthodoxy, but they have been influential as they are embraced by his students, such as Lerkiat, who in turn have passed them to their students.

Of the current generation of string players, Tharanat Hin-on, the head of the Music Department at Khon Kaen University and an experienced performer, has adopted aspects of Worayot’s theory and practice. He sees Worayot’s theory as a contemporary philosophy that produces a modern sound. But he also sees its importance in providing an account of the melodic practice of string players that includes an explanation of tuning and intonation. Tharanat demonstrated Worayot’s theory through a performance of the song Phayasok (Great Sadness). This melody is often used to illustrate tuning issues because it moves between three modes—a process known as plian bandai siang. Using Worayot’s theory, Tharanat demonstrated the inability of Thai heptatonic theory and its nomenclature to deal with different melodic expression of the same note by performing three different intonations of the notes ‘ti’ (น) and ‘fa’ (ฝ). The pitch and fingering of these notes is determined by factors such as their position within the bandai siang and relationship to the ‘tonic’, the melodic contour of the small (wak) phrase unit and the larger...
(prayok) phrase unit in which it sits, the relationship of the notes to the structurally significant pillar tones (luk tok) that fall on the closed chap beats, and expressive factors that are folded into the concept of siang nai udom khati. As the phayasok melody moves between tonal centres, ‘ti’ and ‘fa’ have structurally different roles at various points in the melody, which require different intonations and finger positions. Both Tharanat and Lerkiat endorse Worayot’s idea of using + and – symbols to differentiate higher and lower pitches within the established notation system and have each published instructional books using these symbols. The table in Figure 3 shows Tharanat’s method of indicating the notes on the two strings of the saw duang. As with the method of Worayot, Tharanat uses the + and – symbols to indicate that the notes เท (ti) and เฟ (fa) are sharp and flat. This approach enables the representation of an interval similar to a semitone, which is one of Worayot’s ideas that Tharanat embraces and uses in his teaching.

Conclusion

The imposition of extrinsic thinking on Thai musical practice and the absence of Thai insights into scholarship on their own music has created misunderstandings and a schism between theory and practice. The litany of issues associated with the theory of equidistance stems from some basic misapprehensions. Formulated under conditions remote from Thai practice, the orthodox tuning theory begins from idealized European assumptions about music. Foremost is the flawed but nonetheless normative assumption that different musical traditions have a singular approach to tuning and that each traditions’ approach to tuning is systematic and inclusive of all music within that tradition. Thus, Thai tuned percussion, which were the easiest to measure, became the exemplar for Thai tuning and the model for the theory. The historical faith shown in the concept of equidistance and its ideal theoretical interval in English language publications has kept discussions about Thai tuning within prescribed theoretical boundaries that presuppose it can be explained solely through an accepted
FIGURE 3 List of notes on the low (left column) and high strings (right column) of the saw duang. This figure is an annotated adaptation of the figure published in Tharanat (2018, p. 152).

<table>
<thead>
<tr>
<th>Sai thum (low string)</th>
<th>Sai ek (high string)</th>
</tr>
</thead>
<tbody>
<tr>
<td>เสียง ซอ (G)</td>
<td>เสียง เว (D)</td>
</tr>
<tr>
<td>Siang ‘So’ (G)</td>
<td>Siang ‘Re’ (D)</td>
</tr>
<tr>
<td>เสียง ลา (A)</td>
<td>เสียง มี (E)</td>
</tr>
<tr>
<td>Siang ‘La’ (A)</td>
<td>Siang ‘Mi’ (E)</td>
</tr>
<tr>
<td>เสียง ที (บน)</td>
<td>เสียง ท่า (บน)</td>
</tr>
<tr>
<td>Siang ‘Ti’ (lop) (B flat)</td>
<td>Siang ‘Fa’ (lop) (F flat)</td>
</tr>
<tr>
<td>เสียง ที่ (กลาง)</td>
<td>เสียง ท่า (กลาง)</td>
</tr>
<tr>
<td>Siang ‘Ti’ (klang) (B)</td>
<td>Siang ‘Fa’ (klang) (F)</td>
</tr>
<tr>
<td>เสียง ที่ (บวก)</td>
<td>เสียง ท่า (บวก)</td>
</tr>
<tr>
<td>Siang ‘Ti’ (buak) (B sharp)</td>
<td>Siang ‘Fa’ (buak) (F sharp)</td>
</tr>
<tr>
<td>เสียง โด (C)</td>
<td>เสียง ซอ (G)</td>
</tr>
<tr>
<td>Siang ‘Do’ (C)</td>
<td>Siang ‘So’ (G)</td>
</tr>
<tr>
<td>เสียง เว (D)</td>
<td>เสียง ลา (A)</td>
</tr>
<tr>
<td>Siang ‘Re’ (D)</td>
<td>Siang ‘La’ (A)</td>
</tr>
<tr>
<td>เสียง มี (E)</td>
<td>เสียง ที (บน)</td>
</tr>
<tr>
<td>Siang ‘Mi’ (E)</td>
<td>Siang ‘Ti’ (lop) (B flat)</td>
</tr>
<tr>
<td>เสียง ท่า (กลาง)</td>
<td>เสียง ท่า (กลาง)</td>
</tr>
<tr>
<td>Siang ‘Fa’ (lop) (F flat)</td>
<td>Siang ‘Ti’ (klang) (B)</td>
</tr>
<tr>
<td>เสียง ท่า (กลาง)</td>
<td>เสียง ท่า (กลาง)</td>
</tr>
<tr>
<td>Siang ‘Fa’ (klang) (F)</td>
<td>Siang ‘Ti’ (buak) (B sharp)</td>
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</tr>
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<td>Siang ‘So’ (G)</td>
<td>Siang ‘Re’ (D)</td>
</tr>
</tbody>
</table>

Theoretical formula. This is sustained by an intellectual disposition that is either inexplicably favourable to imported epistemologies or disinterested in checking actual instruments and talking to those who play them. But in framing ideas about tuning from a European perspective, the theory overlooks the heterogeneous nature of Thai
melodic practice and a range of factors intrinsic to Thai music that shape melodic practice. The dangers of imposing European ideas about music on Thai music are observable in the repeated historical failure of empirical evidence to support the theory. The uncritical acceptance of received ideas from questionable sources, such as Phra Chen’s graphic, exacerbate confusion because they smuggle in assumptions foreign to Thai music, such as the belief that within Thai music there exists the abstract concept of a homogenous tuning system that produces a ‘scale’ comprised of definable ‘notes’. Once established, this basic assumption does away with the need to ask musicians about their practice because it is thought the principles of tuning can be theorized in the abstract. But Thai musician, author, philosopher and scholar Pichit Chaisaree has noted that the complexities inherent in the Thai musical system and its approach to melody and tuning are neither explainable through concepts and terms developed for another musical system or reducible to abstract principles.17 If the details about music that are learned by talking to musicians do not surface, the result is the alienation of the tuning theory from the musical system it is attempting to explain.

The absence of practitioner insights means that important differences in the meaning of relevant English and Thai terms escape scrutiny. In this case, this has resulted in concepts and practices known to be fundamentally different being conflated in English language scholarship. When all the tendrils of the various understandings of Thai tuning are tied together, the critical issue becomes one of a fundamental lack of shared understanding of what is being considered—and by what terms—when ‘Thai tuning’ is discussed.

Practitioners have shown that in order to provide an account of Thai tuning that more closely matches the concepts and practices of the musicians who play Thai classical music, the terms of the discussion should be recalibrated to reflect their thinking. This involves abandoning the term ‘equidistant’, along with the numerically prescribed interval that trails along dutifully behind it. A goal of an epistemology of tuning is to determine how claims about what is in tune and what is out of tune can be validated. But this question
cannot be answered without considering how pitch is thought about as well as used in a melodic system, such as in the Thai case, and that is a matter for the musicians. As Thai performers argue, in print and elsewhere, the production of pitch in Thai NFP performance is shaped by the desired melodic qualities manifest in the ear of the performer. Accordingly, their subjective judgements must be at the centre of any model that explains tuning and how pitch is used. Their efforts to draw attention to their practice may go against enshrined ideas, but as their ideas enter the mainstream, taking these ideas up will be essential to the proper understanding of Thai music.

Acknowledgements

The author would like to express his thanks to the Faculty of Fine and Applied Arts at Chulalongkorn University for its support when he was serving as Artist in Residence, and to the Faculty of Fine and Applied Arts at Khon Kaen University for hosting his postdoctoral research.

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NOTES

1. Also called 7-tone equal tempered (7-tet) tuning. An interval is the distance between the fundamental frequency of two musical notes. It is given as a geometric proportion expressed in cents.
2. A mathematical formula for twelve-tone equidistance was also discovered by the Chinese nobleman and Ming dynasty scholar Zhu Zaiyu (Tsai-yu) in 1584.
3. Percussion instruments are tuned by attaching a mixture of lead and wax to the underside of bars on the ranat (xylophones) and the gongs of the khong wong (gong circles). I have argued elsewhere (Garzoli 2015) that although this value is small, if mathematical principles are to be applied and consistently invoked in the explanation of Thai tuning, then the mathematical calculations used to explain the tuning must at least be based on correct values.
4. For an overview of critical disciplinary self-reflection, see themes discussed

5. Discussion with Banharm Palo, 8 January 2017, Bangkok.

6. The term thang has numerous meanings in Thai music (see Garzoli and Bussakorn 2018).


8. Although published posthumously, the book states that the ideas contained within are based on ideas he presented to his students in 1938. Thai musician and scholar Jarun Kanchanapradit provided the translation.

9. This term was used in a discussion I held with a number of highly respected musicians, who wish to remain anonymous.

10. By emphasizing the expressive capacity of pitch, I am not suggesting that players of fixed-pitch instruments do not have techniques to control the expression of feeling, but that they cannot vary their pitch to achieve this goal.

11. For example, Thang Pattayakoson relates the style developed in the Pattayakoson School by revered teacher Jangwang Thua Pattayakoson.

12. Interview with Bruce Gaston, 15 July 2013, Bangkok.

13. Their views were supported by Lasit Isarangkura, who was at the time director of research at the Department of Fine Arts, on 12 June 2015, Bangkok.


15. Saw would normally be transliterated as ‘so’ using the Royal Thai General System of Translation. However, there is no standard spelling for ‘saw/so’ in the English language academic literature nor is there consensus among the major authorities on Thai music on the correct spelling. I use ‘saw’ to bring it into line with other scholars and the Department of Fine Arts.

16. The Thai spelling is ‘ทฤษฎีเสียงดนตรีไทย’.

17. Interview with Pichit, 13 December 2016, Bangkok.

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