
*Harmonious Triads: Physicists, Musicians, and Instrument Makers
in Nineteenth-Century Germany* by Myles W. Jackson

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Harmonious Triads is a scattered book by Myles Jackson about musical practice, physical acoustics, instrument-making, musical pedagogy, and the social and political role of music in the German states and then the unified Germany of the 19th century. One of the themes in a number of its chapters is the impact that natural scientists interested in physical acoustics had on music-making in private homes, churches, and concert halls. Thus, two figures of interest to Jackson are E. F. F. Chladni, the experimental scientist who made a study of the acoustical properties of bells, bowls, and other vessels, and Wilhelm Weber, the more mathematically inclined physicist who, by building on Chladni's study of longitudinal vibrations, was able to work out the physics of reed pipes. At the same time, Jackson wants to call our attention to the parallel contributions made by artisan instrument makers—many unknown to us today—and even industrialists with or without formal technical scientific expertise. Readers thereby discover a group of very different people responding in very different ways to, and even challenging, German ideals of music at this time.

For example, we discover that some straightforwardly scientific results were used to promote the design of new musical instruments and the improvement of already existing ones. Thus, Chladni applied his research to the design of a new instrument that he called the 'euphone', a set of 40 glass rods of different length fixed at their nodal points to a sounding board. A musician could produce notes of different pitch by rubbing different rods with a moistened finger. The tones emitted by this instrument were not unlike that of another new instrument of the time, the glass harmonica; and it apparently

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answered a call heard from different quarters for a new quality of tone in musical expression—one that captured a sought-after spirituality or other-worldliness. On the other hand, Weber’s results were explicitly intended to improve the construction and performance of organs. He hoped to fix a metal tongue in an organ pipe so as to play off the transversal vibrations of the former and the longitudinal vibrations of the latter in such a way that the pitch emitted would remain constant even as the volume increased or decreased depending on air flow. The rationale here was that, in the real world, transversally vibrating bodies tend to emit tones slightly higher in pitch as the amplitude of their vibrations diminish, whereas the opposite is true, again in the real world, for bodies that vibrate longitudinally. By engineering a body that produces both kinds of vibrations at once, but in such a way as to use these contrary acoustical tendencies against each other, Weber aimed to help instrument makers design organs capable of crescendos and diminuendos. To that extent, he apparently took himself to be answering a call for a more musically sensitive, expressive, perhaps even spiritual, style of play in contemporary German church music.

Chladni and Weber are interesting because their work was motivated, at least in part, by a desire to use science to meet the perceived needs of music making. But the history of instrument making as craft rather than science as such also provides examples of challenges to certain musical ideals of the time. Thus, Jackson documents a host of ‘mechanicians’—some trained as clock-makers, some as organ builders—who produced automated music-making devices: for example, a mechanical trumpet player.¹ We also have a mechanical device that was supposed to imitate a whole orchestra.

These new instruments seem to have multiplied and outdone one another in ambition and weirdness of name: thus, we have a symphonium, a bellonion and even something called the ‘chordaulodion’. I am not sure what the motivation for these contraptions could have been at the end of the day, beyond showing that it could be done, with the hope, presumably, of showing that it could be done better even than Jacques de Vaucanson had in the 18th century with his

¹ I was very happy to find some photos of this device which reveal the inner mechanism, though I have to admit that it is still not very clear to me how this thing was supposed to work and what it may have sounded like.

mechanical flute-player, his pipe and drum players, and—of course—the mechanical duck that could allegedly eat, digest and pass duck poop. Vaucanson himself must have been trying to show that he could outdo Hero of Alexandria in the design and construction of automata. If that is right, then the musical automata of the 19th century should probably be understood as an effort to continue and best a tradition of practical mechanics going back to Alexandria of the third century AD. If that in turn is right, I would guess that musical aesthetics as such mattered to these mechanicians not for their own sake, but as a way to set benchmarks for success: you could claim to have bested Vaucanson (and *a fortiori* Hero), if your trumpet-player was more convincing to the ear than his flute-player. In spite of the curiosity that these things sometimes provoked in real musicians (like Beethoven, for example, who wrote ‘Wellington’s Victory’ for an automaton built by Mälzel), it is surprising to learn that they played any role at all in debates about musical aesthetics. At the end of the day, one would expect people to have thought that, however clever some of them might be, they were all pretty gimmicky: I half expect to learn in some future historical study that the merry-go-round has its origin in this technology. But, as Jackson points out, musical automata were an object of interest and even concern to at least one of the German Romantics, namely, E. T. A. Hoffmann, one time music director of the opera in Bamberg and contributor to the *Allgemeine musikalische Zeitung*.

As Jackson notes, Hoffmann—or, rather, some of his characters—are critical of musical automata like those of Vaucanson because they doubt that such devices can ever truly express what is going on in the music: at best they can emit tones in the right order, in the right rhythm, and at the right tempo. Hoffmann’s characters rightly doubt whether that is all there is to musical performance. This is at least part of what Hoffmann has Ludwig and Ferdinand say in the short story called ‘*Die Automaten*’. This is precisely the sort of criticism I think that one would expect: it is the musician’s own twist on the dismissive remark that musical automata are just gimmicks. But this is only part of the criticism voiced by Hoffmann’s two characters. In a passage that Jackson himself quotes, but does not fully comment on, Ludwig is made to say that the effort to build musical automata is something ‘*drückendes, unheimliches, ja entsetzliches*’. He goes on to describe it as ‘*heilloser und gräuliches*’. These are very strong words

with connotations of horror. They might have been intended to express hyperbolic horror at the sound of mechanical music offensive to heightened Romantic sensibility, in something like the presumably mock horror which a teacher of mine at the University of Chicago once (perhaps twice) expressed at the thought that the Philosophy Department would make an offer to a person whom he suspected of high charlatantry: 'I'll die if he comes!', he exclaimed with great passion. But context suggests that Hoffmann's Ludwig means what he says quite literally. This needs explaining.

I do not myself know quite how to give a fully satisfying account of the gimmicky, musical or otherwise, but my sense is that it is usually incompatible with the horrifying. Jackson's explanation, that Hoffmann is out to defend the 'organic' over the 'mechanical' in music, does not seem adequate to me. All things considered, I much prefer organic ducks to mechanical ducks, but the thought of Vaucanson's mechanically digesting duck doesn't alarm me at all: it tickles me. I would have thought that Hoffmann's Ludwig would be tickled too at the the sight and sound of a mechanical flute-player. Instead, he and his friend Ferdinand react as if they had been forced into the presence of the Unholy Undead, something that, by falsely simulating life, is a threat to life itself. Perhaps Jackson might say that the threat is real, namely, that the musical automata will be so perfected as to take over the concert halls and banish living, breathing musical performance as Ludwig knows it. But such an account flies in the face of what the two friends actually say: they agree that even the most pathetic human musician will play more soulfully than any mechanism. This may well have been Hoffmann's own view. There is no reason to think that he would have been at all impressed by the highly favorable review cited by Jackson of the Kaufmanns' presentation of their apparently quite sophisticated musical automata to the British Royals at Buckingham Palace in 1851. The reviewer speculates that such automata might even surpass human organists. Hoffmann would never have taken such a claim seriously: every musical machine, however technically impressive, will always lack something crucial to musical practice, namely, spontaneity, i.e., an ability to sense on the spot what the moment requires and to adjust as best one can. In '*Der Sandmann*', the student Nathaniel falls madly in love with Olimpia, the presumed daughter of his professor, who dances and plays the piano with great technical proficiency. Everyone can tell she is not quite all there:

there is something studied and clockwork in everything she does at the keyboard and on the dance floor. The biggest give-away clue, of course, is that she replies, ‘*Ach!*’ to everything you say. Only Nathaniel cannot see that something is amiss, but that is because his ‘vision’, i.e., his power of discernment, has somehow been taken from him by the ‘*Sandmann*’. He is sick, but every sane person knows the truth instinctively long before it comes to light, namely, that Olimpia is just a clever wind-up doll. That is all that any musical automata can ever be, on Hoffmann’s view. Whence the puzzle: why fear such gimmicks, as one would a vampire?

I am sure that there is a whole book’s worth in the topics that I have mentioned. Moreover, Jackson is surely right to think of using Hoffmann for his distinct perspective on them (and probably wrong to think that Goethe and Hegel are all that relevant however supportive they may have been of the ‘organic’ over the ‘mechanical’) because Hoffmann had an investment, both personal and professional, in musical practice. He does not just cause his characters in ‘*Die Automaten*’ to hyperventilate about musical automata; he has them say enough to suggest that he was aware, and likely approved of, Chladni’s euphone and other such innovative musical instruments. Moreover, though he died in 1822, shortly before Wilhelm Weber started his work on the physics of reed pipes, he has his characters explicitly call for the application of ‘true mechanics’, as opposed to the false mechanics practised by Vaucanson and his later German counterparts, to the improvement of musical instruments played by human musicians. (That he would have approved of efforts like that of Weber to improve the expressive play of the organ seems likely, especially in view of the fact that one of the central characters in his masterpiece, *Lebensansichten des Katers Murr*, Master Abraham, is a highly accomplished organ builder.)

But what Jackson gives us is both more and less than the book that I would have liked to read. Less, not just because he does not solve the genuine puzzle about Hoffmann on musical automata. The problem is first of all that the story, as he tells it, raises a host of questions. That is sometimes the mark of a successful book. But if the questions are numerous and natural enough, they raise the suspicion that the book has not yet been completed. One characteristic example will have to suffice.

I still do not understand, even after re-reading the relevant parts of the book, what impact Wilhelm Weber's scientific work on reed pipes had on organ design and construction. On the one hand, Jackson invites us to think that it had a considerable impact just by virtue of the favorable notice it received from Johann Gottlob Töpfer who was a professor of music at the *Schullehrerseminar* in Weimar, an organist and also, it seems, a prominent organ builder. This Töpfer, who comes up twice in the book and probably deserved more focused attention from Jackson gives him, published a number of influential things on organ-building from roughly the 1830s to the 1850s, one of which seems to have been an important textbook. Töpfer discusses Weber in these works, arguing that his research was essential to the construction of fine organs with reed pipes. Given Töpfer's stature as an organ builder and the influence of his textbook, it would seem that Weber's research must have established itself as foundational for organ technology in the German states of the early to mid-19th century. Indeed, that is the conclusion Jackson apparently wants us to draw; but a sentence later he takes it all back. Thus, he writes:

As Töpfer's texts were the ones most often consulted by organ builders during the mid-19th century, Weber's equation became a part of the organ-building process. Indeed, his acoustical research, though itself without lasting practical influence, signaled a collaboration among German physicists, musicians, and musical-instrument makers that was to last until at least the end of the nineteenth-century. [137]

I am baffled by these two sentences: did Weber, or did he not, have an impact on organ building? (He would remain interesting even if he had had none.) I expected the subsequent paragraphs to clarify this, but they emphasize only that organ design and construction in the German states seem to have lagged behind that of England and France. I then hoped to find clarification elsewhere in the book. Instead, I found myself faced with more unanswered questions.

For example, I learned that the same Friedrich Kaufmann who so impressed Queen Victoria and Prince Albert with his musical automata at Buckingham Palace had devised his own techniques for reed-pipe compensation that allowed for crescendos and diminuendos without changes of pitch—about 10 years before Weber announced his first findings. Together with his father, Kaufmann was involved

in organ-building. Did he not consider using the techniques that he had developed for his automata in the development of more expressive organs—greater expressivity being, as we learn from Jackson, a recognized desideratum among German organ-builders in the 19th-century? Was Weber aware of Kaufmann's innovations? If not, then how far-reaching and fruitful was the collaboration among 'German physicists, musicians and musical-instrument makers' of which Jackson makes such a big issue in the passage that I just quoted and in the book as a whole? Jackson is surely right to make the history of organ building an important part of his story. But that he raises these and many other such questions, apparently without even realizing it, is a sign that he has written less than the book I would have liked to read.

But he has also written more than the book I would have liked to read. He tries not only to cover the topics that I have mentioned, but a host of others as well, e.g., the drive to standardize tuning in orchestras throughout Europe, the invention and marketing of the metronome, and the attempt to use mechanical aides in the instruction of piano technique. At the same time, he also wants to bring cultural history into the mix. This concern leads him to take an interest in the way that German natural scientists and doctors socialized. That they made music, more specifically organized choral concerts, as part of their professional meetings takes on a great significance for Jackson. He claims that this activity was fundamental for defining their identity, both professional and national, and that this fact in turn is somehow illuminating. The problem is that it is very hard to tell what precisely has been illuminated after this fact has been called to one's attention.

At a minimum, Jackson wants to say that it facilitated personal and professional networking among these people. But even that claim seems overstated to me. One of the cases that is supposed to be illustrative of the claim and its significance is that of the relationship between the aforementioned Wilhelm Weber and Carl Friedrich Gauß. They met at the 1828 *Versammlung deutscher Naturforscher und Aertzte* where Weber presented his research on the physics of reed pipes. Gauß attended the lecture and was sufficiently impressed by it and Weber personally to recommend him for the physics chair that became vacant in Göttingen in 1830. There is no doubt that the *Versammlung* as a professional institution facilitated the contact

between these two people, as such meetings are wont to do. But that there was a choral concert at this meeting and that the musical activities at other such meetings were explicitly intended by the organizers to create national and professional bonds among the participants sheds no light on this relationship or—I'll wager—on any other like it. Let me put this in perspective.

In the late summer of 1995, I attended a conference on German Idealism held at Dartmouth College. A fairly elaborate banquet was organized for the last evening, to be followed by dancing. One of the organizers told me that she liked the idea of dancing because it was a way for American and German scholars to 'get down together'. The music was insufferably loud and the forced hilarity oppressive: I fled. Suppose, for the sake of argument, that Gauß was as unreceptive to choral concerts as I was to dancing. Then the *Versammlung* of 1828 can be understood to have facilitated his relationship with Weber just to the extent that it brought the two together professionally: music would have played as much of a role in it as dancing has played in my professional development. But now suppose that Gauß loved choral concerts. What follows? Nothing, so far as I can see. The thing that clearly mattered above all to Gauß, as Jackson himself points out, was whether Weber had the 'right stuff' for Göttingen. Given that he did, it was apparently a bonus that he struck Gauß as *liebenswürdig*. But, again, Gauß could have formed this judgement with or without choral concerts or indeed any efforts to forge some kind of national and professional identity of German doctors and scientists. That choral concerts and *Liedertafeln* were organized for professional meetings of such people is—to my mind—nothing more than a mild curiosity, about as interesting as the fact that dancing sometimes goes on at academic conferences in North America.

In short, there is certainly at least one book's worth in *Harmonious Triads*; but the book, as it stands, badly lacks focus. It covers a vast range of topics without doing enough to synthesize them or show how they fit together. Now it might be said that this is a virtue—indeed, one that comes from the just recognition that historical reality is very messy. But when a book proves to be just as messy as the thing it covers, a reader can be forgiven for feeling frustrated. Historical studies must never falsely simplify reality, but it is not unreasonable for us to expect them to shed light on it. If we cannot expect that, I am not sure why we should be expected to read them.