



Chapter 6

On the resistance of the instrument

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Emotional expression is often regarded as central to the purpose and meaning of art. In large part this is because it encompasses a number of different values, each more or less present as a product of the awareness, deliberation, inventiveness, and social coordination to be found in the expressive act (cf. Scherer in Chapter 5). My goal here will be to outline these values in an act of musical performance, highlighting the role played by the *resistance* of the instrument to the immediate realization of the musician's intentions. Resistance is also something that comes in degrees, and by examining some recent trends in musical instrument technologies, I will argue that relative *transparency* is also a viable choice, depending on the values to which one aspires.

Let us begin by discerning the values to be found at a general level in the expression theory of art. A classic statement of the theory is R. G. Collingwood's (1938) book *The Principles of Art*. Here Collingwood articulates the view that the business of art "proper" is to express the emotional state of the artist. Collingwood means something very specific by the term "expression," however. It is not simply a matter of revealing one's emotion. In a famous passage, he describes the process involved:

At first, he is conscious of having an emotion, but not conscious of what this emotion is. All he is conscious of is a perturbation or excitement, which he feels going on within him, but of whose nature he is ignorant. While in this state, all he can say about his emotion is: "I feel... I don't know what I feel." From this helpless and oppressed condition he extricates himself by doing something which we call expressing himself.

The artist begins with a vague, inchoate impulse which he or she then clarifies by means of expression. This is a matter of bringing the state to full articulate consciousness, so is quite unlike the casual betrayal of one's emotional state (which could occur without the awareness of the subject). Collingwood is also keen to emphasize that the artist does not simply reproduce some pre-conceptualized idea, for that would be mere craft. He rather gives form for the first time to a *new* mental state, individualized in its own unique way in the act of expression. Thus while the value of expression might sometimes be conceptualized in terms of its cognitive benefit, of enabling an individual to gain some self-understanding, it is also rooted in the value of creativity. The struggle to express oneself is a means towards self-manifestation or self-becoming. And if it is engaged in sincerely, it cannot help but result in something original, because it will be a product of the artist's individual experience.

A similar theme is to be found Hegel's (1835) *Lectures on Fine Art*:¹

The universal and absolute need from which art (on its formal side) springs has its origin in the fact that man is a *thinking* consciousness, i.e. that man draws out of himself and puts *before himself* what he is and whatever else is. Things in nature are only *immediate* and *single*, while man as spirit *duplicates* himself.... This aim he achieves by altering external things whereon he impresses the seal of



his inner being and in which he now finds again his own characteristics. Man does this in order, as a free subject, to strip the external world of its inflexible foreignness and to enjoy in the shape of things only an external realization of himself. Even a child's first impulse involves this practical alteration of external things; a boy throws stones into the river and now marvels at the circles drawn in the water as an effect in which he gains an intuition of something that is his own doing.... [Introduction, Section 6i]

Both Hegel and Collingwood, then, align artistic creativity with a supposedly universal drive; to make manifest our inner natures. Artistic expression simply brings this drive to its highest pitch of sophistication. And why should we want to make manifest our inner natures? Its motivation seems to be drawn from the fundamental will to live and to flourish. As such, no further justification seems necessary. That's just the kind of creature we are.

At the same time, however, Collingwood recognizes that the artist is interested in sharing his impressions with the wider community. Art to some extent is a public service since the artist expresses emotions on behalf of the audience. The artist "is singular in his ability to take the initiative in expressing what all feel, and all can express" (Collingwood 1958, p. 119). This is no mere side-benefit to expression, but an important part of bringing the artist's expressive intent to fruition. For if other people cannot re-create the artist's emotional state by engagement with the work, then the artist cannot be sure that he or she has had a genuine aesthetic experience (Collingwood 1958, pp. 311–15).

For Tolstoy, the value of sharing one's emotions is paramount. Adopting a fairly simplistic theory of expression as a kind of emotional contagion he claims that, "every art causes those to whom the artist's feeling is transmitted to unite in soul with the artist, and also with all who receive the same impression" (Tolstoy 1899, p. 163). Indeed, so important is the value of sharing for Tolstoy that he demands that art only express emotions that everyone can share; emotions such as merriment, pity, cheerfulness, and tranquility or "feelings flowing from the perception of our sonship to God and of the brotherhood of man" (Tolstoy 1899, p. 164). All other arts either unite some people at the expense of alienating others (such as patriotic arts) or are inaccessible to the masses. An unfortunate consequence of this view acknowledged and accepted by Tolstoy is that Beethoven's Ninth Symphony turns out to be an inferior piece of work because it is rather complicated. Collingwood, in contrast, takes the rather more sympathetic line that the artist need only share his emotions with a limited subset of likeminded fellows—and indeed that it would be insincere for the artist to play to the lowest common denominator.

We have seen that for Collingwood, the main point of expressing oneself is that it brings one's creative insight to fruition. The value of sharing is somewhat subservient to the value of creativity or self-realization (including perhaps, the self-realization of certain members of the audience). However, Tolstoy clearly regards the value of sharing emotions in different terms. There are strong moral overtones to Tolstoy's discussion; that art should contribute to the interpersonal harmony of the community. And it is plausible that sharing emotions through art can stimulate feelings of belonging; of overcoming loneliness or the more profound worry that others cannot understand what it's like to be you. While we need not insist with Tolstoy that art is best when it promotes a quantitatively maximal level of sharing, we can still recognize that the sharing of emotions is a valid goal for art. And again, like the drive for creativity, we can derive the value of sharing from the basically social nature of humans. We are just the kind of creatures that thrive in mutually supportive environments.

There is also another, less frequently noted value to be found in expression, that of pleasure. It is a value compatible with both Tolstoy's ideal of emotion sharing and Collingwood's ideal of creative articulation. But we also find it explicitly discussed in Dewey's (1934/1980) *Art as Experience*,



particularly in connection with the resistance that the environment offers to one's emotional impulses:

Nor without resistance from surroundings would the self become aware of itself; it would have neither feeling nor interest, neither fear nor hope, neither disappointment nor elation. Mere opposition that completely thwarts, creates irritation and rage. But resistance that calls out though generates curiosity and solicitous care, and, when it is overcome and utilized, eventuates in elation. [pp. 59–60]

Dewey has a rather broad notion of resistance that encompasses the whole struggle of the artist to bring objective form to his or her expressive intent. As the above passage indicates, Dewey regards resistance as a necessary condition for self-consciousness since a creature that never met resistance to its impulses could not become conscious of the independence of the world to its will, and thus its distinction from the world. But in addition to all this metaphysical talk, we also see the elation that accompanies a successful expressive act. To *express*, in the traditional sense of expelling something, of overcoming some resistant material, feels good.

We can now see the ways in which the various values of expression are drawn out in the act of musical performance. Beginning with the value of pleasure, we observe that the challenges involved in getting a good sound out of a musical instrument are, for the musician at least, an important part of their *experience* of the music. There is an immediate connection between the energy required to do something and one's sense of power, or between the ability to transcend the limitations of the instrument and one's sense of grace or freedom. Eric Clarke (2006) for instance describes the pleasures involved in interacting in a controlled and fluent manner with an instrument that is often "unbearably uncomfortable or uncooperative." He cites a case in which a pianist reports enjoying the use of his thumb in a certain passage even though it is not the most efficient fingering available. He also describes his own heightened enjoyment of violin music when performing in a comfortable key.

Since these various feelings of enjoyment, power, or gracefulness are generated as a result of interacting with the musical instrument, the physical act of performance must contribute to the emotional state felt by the performer. Were the instrument *not* to a degree resistant to the intentions of the musician, their emotional state would be different. As such, these pleasures are not incidental to the act of expression. If the performer is engaging in a Collingwoodian act of creative *self-expression*—the kind of immediate creative articulation found not just in improvisation but any creative interpretation of a score—the physical interaction with the instrument will also shape that mental state expressed by the performer in the musical event. In these circumstances, then, we should recognize that the instrument is not merely a means to the end of realizing some pre-existing expressive sentiment, but a vital part of shaping expressive content from the beginning.

In a previous paper (Cochrane 2008) I described at length how the performer may use the instrument to think through his or her emotion, and that the music and its means of production may even be construed as a literal component of the musician's mental state. My concern in that paper was to establish the point that musicians may use music to physically extend the cognition of emotions. What I would like to elaborate on here, however, are the ways in which the interaction with a musical instrument also serves the *values* that motivate the act of musical expression in the first place. We may note, for instance, that while the pleasure of performance is perhaps most intensely felt by the performer, the audience is also capable of vicariously enjoying that pleasure by empathically re-creating the performer's movements. When we watch a concert pianist, even if we have no experience of playing a piano ourselves, we have a rough idea of what it takes to press on a piano key and produce a sound. As a result, the way that the pianist moves about the instrument has the potential to convey a great deal of information about the attitude of the performer



(cf., again, Clarke 2006). We can detect, for example, flamboyance in movements which we know to be quite unnecessary to the production of the sound. The point generalizes to the full range of emotional attitudes that may be conveyed in the interaction with an instrument; the sense of rage conveyed by an aggressive strike, or desolation conveyed in trying but failing to produce a sound. As such, the physical resistance afforded by the instrument is a significant means by which such emotional information may be shared.

We should admit here that at least some of the performer's movements may simply be the product of tics or ingrained habits. Moreover, some of the performer's gestures are likely to be intentional and communicative, where others unconsciously betray emotional attitudes, and still others are determined by purely physiological factors. In many cases it may be impossible to separate these various influences. Still, this is no different from the complexities and ambiguities that attend the interpretation of everyday body language. We are nevertheless prone to draw inferences about personality and attitude on observing such behavior. Collingwood would no doubt wish to exclude non-intentional movements from the artistic event properly so-called, but I find myself unwilling to draw such sharp distinctions in this regard. Any musician performing in front of an audience must accept that the audience will sensitively engage with the entire perceivable event. And if we were to learn that the groans and expressive behaviors of a pianist like Glenn Gould were entirely unconscious, I do not believe this would be sufficient grounds to exclude these factors from our appreciation of his performances, or indeed of him as a person.

In addition to the value of emotion sharing, the resistance of the instrument also serves the value of creativity. It is in exploring the capacities of the instrument that the musician's creative imagination is stimulated because it allows him or her to see what is possible (see again Cochrane 2008 for discussion). But the performer must often also seek inventive ways to adjust to the physical constraints of the instrument in the pursuit of his or her expressive intent. Stravinsky (1956) makes this point in his *Poetics of Music* when he observes that constraints are necessary to stimulate the creative imagination. And Tōru Takemitsu makes a similar point in with regards to the traditional Japanese string instrument, the biwa:

The biwa could be called the mother of Japanese music. The major characteristic that sets it apart from Western instruments is the active inclusion of noise in its sound whereas Western instruments, in the process of their development, sought to eliminate noise. It may sound contradictory to refer to "beautiful noise," but the biwa is constructed to create such a sound. That sound is called sawari, a term that also has come to be used in a general sense... The term sawari, which also means "touch," may additionally mean "obstacle." Thus, sawari is the "apparatus of an obstacle" itself. In a sense it is an intentional inconvenience that creates a part of the expressiveness of the sound. Compared to the Western attitude toward musical instruments, this deliberate obstruction represents a very different approach to sound.... The monthly biological function in women is also referred to in Japanese as the 'monthly sawari'—a natural inconvenience for women but essential in producing children. For me there is something symbolic about this: the inconvenience is potentially creative. In music the artificial inconvenience in creating sound produces the sound. The resulting biwa sound is strong, ambiguous, deeply significant. [Takemitsu 1995, pp. 65–6]

What Takemitsu is describing here is a traditional way to resolve aesthetic problems; to ironically embrace the imperfection, to intensify it, marking it out as an intended aesthetic feature, thereby allowing us to appreciate its beauty. It once again underlines the way in which the artist's expression is guided by his or her physical medium; accepting and celebrating the natural qualities of the object. But while Takemitsu is correct to claim that the development of Western instruments has often sought to eliminate noise, he is wrong if he also wishes to imply that Western music is not also guided by the embrace of imperfections or the more general creative interplay with the



resistant instrument. These seem to be musical universals. Note for instance the rise of “extended technique” in a number of instrumental performance practices. For example, oboists now quite commonly employ multiphonic effects—where all those cracks and whistles that were once the bane of the oboe performer’s life are now deliberately employed.

The same guiding values can be seen in the rise of computer music. Synthesized sounds have permitted the average individual, lacking access to a backyard orchestra, to employ a far more diverse range of sounds in their creative endeavors. Naturally the sounds produced by keyboard synthesizers are often flat and homogeneous in comparison to what can be achieved with the original instruments—though the capacity of computers to reproduce the characteristics of different instruments has greatly improved. A greater worry for computer-based musicians is that when programming musical performances, the regularities of timbre, attack, and rhythm result in a sound that is inexpressive and dull. As a result, computer musicians often spend a great deal of time reintroducing irregularities; the mistunings or distortions of an more intense attack, or slight inconsistencies of timing that the music sound “more human.” What we see here then is that the opening up of creative capacities is supplemented by a desire to simulate the feeling of a live performance, of a real performer with whom the listener can enjoy a sense of sharing; perhaps not sharing emotions specifically, but certainly a sense of life.

A similar issue is faced in recent developments in interfaces for musical expression; a general movement in present-day musical practice towards designing new instruments for employment in live performance, typically mediated by electronics. The same drive that pushes us to diversify the sonic palette also pushes us to find new ways to interact physically with sound, implicitly recognizing that the attitude taken towards the device shapes expressive content. At the same time, a common complaint about such instruments is that it is opaque to the listener what the performer is actually doing to get the sounds out of them. This problem is compounded by the frequent use of algorithmic routines, and even probabilistic outputs, such that a significant aspect of the music is not controlled directly by the performer at all. Where there is a disconnection between the electronic generation of the sounds and the physical means to activate these processes, we have no idea to what extent the performer’s movements express emotional content, or even attitudes as basic as success or failure of intent (see Fels 2004; Gurevich and Fyans 2011 for discussion). This may be somewhat alienating for the audience. As such, the new-interface community is faced with finding effective ways in which the intention of the performers, their skill, and expressive goals, can be communicated to the audience, again, to satisfy the listeners’ and performers’ values of sharing.

We have seen how the resistance of the instrument contributes to the creative act of the performer. For the listener also, an appreciation of the physical resistance of the instrument contributes to a significant degree to their sense of what is going on with the performer, and as a consequence their empathic sense of the performer’s feelings. There is, however, a counter-trend in the development of instrument technologies seemingly aimed at *reducing* the resistance of the instrument—that is, increasing the transparency between the performer’s state of mind and the musical results. One important recent development in the new interfaces movement is the use of physiological sensors to measure such variables as heart rate, skin conductance (sweat), facial expressions, muscle tension, and skin temperature. It is now possible to directly sonify these signals to produce sounds (e.g. Knapp and Lyon 2011).

In particular, it has been the goal of my own research of late to use these signals to generate music that appropriately matches the actual emotional state of the performer—with the operational target that listeners can identify the self-reported emotion of the performer with a success rate comparable to our capacity to detect emotions in facial and vocal expressions, if not better. I call this system “the mood organ.”ⁱⁱ An important theoretical component of the mood organ is



that the various signals collected by the physiological sensors contribute proportionally to dimensional measures of emotional experience. For instance, muscle tension and heart rate contribute to the emotion dimension of power (similar, though more narrowly specified, than the common dimension “arousal”—see Cochrane 2009 for discussion). Changes in mouth corner position and heart rate variability contribute to the dimension of valence (rises in these measures tend to signal more positive emotions). The correlations here are not always entirely unambiguous—heart rate variability also increases in the emotion of disgust—clearly a negative emotion (see Kreibig 2010 for an extensive review). Yet when the various physiological signals are combined, dimensional correlates can be more reliably discerned. These dimensions are then fairly straightforwardly used to manipulate musical variables. For instance, a rise in positive valence can be made to increase the harmonic consonance of the music. Because the physiological signals continuously update the dimensional variables, I use looping samples than can be triggered and gradually adjusted in various ways, comparable to minimalist music. But the music also tends to fluctuate expressively in ways that we never find in minimalist music, leading to a musical result that is surprisingly unpredictable—displaying a striking *lack* of long-term emotional narrative.

Now to the extent that anyone off the street can put on the various sensors, and allow music to be produced regardless of his or her intentions, this system could not, according to Collingwood and Dewey, count as expressive. The sounds produced would *not* be art properly so called, but craft, or the mere betrayal of emotion. Moreover, since I have been extolling the virtues of instrumental resistance for promoting the values of emotion sharing, creativity, and pleasure, one might be forgiven for asking, what is the point of this system?

While it is true that the naïve use of such a system is not artistic, we could understand my role in developing the device as comparable to that of an architect who shapes the experiences of others. I have of course had to make musical choices as to what particular sounds should accompany what physiological changes. And although the mood organ is mechanically translating bodily states, it also *feels like something* to hear one’s bodily states so translated, and it cannot help but affect the on-going development of one’s emotional state. Subject and sound are locked into a tightly reciprocal relationship, just as we find in the attempt to express one’s emotions with a traditional musical instrument. Moreover it is anticipated that, after prolonged use, some people will develop expertise in controlling their physiological responses by means of this musical feedback (though sweat and heart rate variability are rather more difficult to control than facial expression and muscle tension). As a consequence, some people should be able intentionally plan the music produced and give it a long-term narrative structure of their choosing.

The difference between this system and ordinary musical expression is also somewhat analogous to that between photography and painting. That is, there is a causal mechanism involved in this system that reliably produces an “image” of the performer’s current bodily state. But as in the case of photography, it should still be possible to adapt the system to one’s own ends in controlling the content that is imaged. In photography, we also appreciate that we are witnessing scenes that have concrete reality, or at least did so, and there are interesting effects concerning whether the subjects of a photograph are aware of being photographed. Similarly, the listener to a mood organ production may appreciate the glimpse into the actual inner workings of another person’s body, and may contemplate shades of sincerity and emotional commitment that should be quite distinct from that of traditional musical performance, since it is often the case that traditional performers must remain calm if they are to successfully carry off the physical demands of the music (though see Scherer in Chapter 5 for a discussion of the variations involved here).

Besides the various creative uses to which this system might be put, however, the value that this system is primarily designed to promote is that of sharing emotions. This is not meant in the sense that a

listener may read off the emotional state of the performer by listening to the music produced (though certain scientific goals may be achieved in that way) but that it provides a way for multiple performers to mutually engage in the formation of their emotional states. In particular, having established ways to transform an individual's bodily responses into music, the idea is to perform the same procedure for several people at once. This can be achieved in a number of different ways. We can simply allow that several performers individually produce music in a common setting (perhaps restricting ways in which the music produced can clash). Alternatively, we can divide up responsibility over the musical product such that one individual's physiological responses are responsible for one aspect of the music (for instance the harmony) while another's responses are responsible for its rhythm. Or finally, we may simply take an average of the group's signal and use that to generate our musical variables. In all these cases, we can observe the way the performers' mutual awareness of the music produced results in natural adjustments and synchronizations of their emotional states, and quite possibly feelings of intense rapport, as a consequence of their mutual awareness of this synchronization.

Naturally it is possible for performers of traditional instruments to engage in the collaborative expression of emotional states in comparable ways. But the mediation of instrumental skill presents considerable barriers to the sincere committal towards one's own and other's musical productions, because one is typically occupied with a critical stance towards the quality of the music produced, and is often unsure of the emotional committal of the other participants. A certain standardization and automaticity of the expressive means helps to alleviate these worries, just as it does in ordinary verbal communication—where we are (relatively) more confident in sharing common meaning for our terms.ⁱⁱⁱ

Compare this with the historical development of instrumental technologies and we see that the rise in complexities and variances of expression are often tempered by moves towards standardization. Take for example the way that the shape of the violin bow has evolved since the Baroque period. The straight long bows that we find today were not established as a standard until the early 19th century. Prior to this time, a number of different shapes were employed. Bows of the Baroque period are often shorter, with an arch-shaped frame and pointed tips. These qualities make it harder to produce an even tone. Yet violinist Girolamo Bottiglieri has emphasized that they afford the player a greater range of possible sonorities. Similarly the oboe of the Baroque period is a considerably less complex instrument than today's oboe with its mass of silver keys and piping, and as a result it is much less stable and more difficult to play. Yet the oboist Béatrice Zawodnik describes the older oboe as more flexible, and thereby possessing a greater expressive potential (Bottiglieri and Zawodnik 2009).

In both cases, the demand for an instrument that can more reliably produce a certain sort of sound has resulted in developments that have sacrificed a certain degree of personal flexibility. When one must perform ensemble music, or follow the instructions of a musical score, there is a pressure to conform to certain standards. And given enough time, these pressures will, in a manner analogous to natural selection, result in instruments that can more effectively satisfy these pressures. The value ultimately behind these developments is, I submit, the value of the shared engagement in musical performance, because they are essentially solving a coordination problem. They allow many people to coordinate the expression of their emotions, guided towards an ideal of shared emotion. The mood organ is geared towards the same ideal.

Conclusion

Expression theory synthesizes a number of different values: the value of creativity, sharing, pleasure, and associated values of (self-) understanding and moral harmony. Different authors prioritize

these values in different ways, while still pointing to basically the same, quite fundamental behavior—the act of expression—an act common to our everyday communicative behaviors, brought to its highest pitch or fluency in the creation of art.

Developments in musical instrument technologies have continued to be driven by the values inherent in artistic expression, particularly with respect to enriching our capacities for creativity, and sharing our emotions with others. Neither of these fundamental human values is in any danger of being undermined in our musical culture. For while they may sometimes seem to be in tension, as soon as we develop new ways to satisfy one value we tend to seek ways to satisfy the other as well. At the same time, we should recognize that musical expression is achieved not just at the individual level but also at the group level, and that as a consequence what may appear to be conflicting developments (i.e. towards complexity or simplification, towards resistance or transparency) may simply reflect the same ideals pursued at different levels of human organization.

Finally, while new technological developments certainly offer exciting new musical opportunities, there is no suggestion here that our means of expression are superior to those of the past. Because musical expression is essentially geared towards the self-realization of the individual, and how we understand each other, it is something that must be renewed in each generation, making use of the materials at hand.

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Notes

- i This is not surprising, since Hegel was a major influence on Benedetto Croce (1902/1992), who was himself major influence on Collingwood. Thanks to Jenefer Robinson for pointing this out.
- ii This is after a fictional device described in Philip K. Dick’s book *Do Androids Dream of Electric Sheep?* which is used to regulate emotions.
- iii The automaticity of the system will also free-up the “performers” to emotionally interact with each other in more everyday ways.

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