

# Automated ‘Wow’ Generation In Musical Composition

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## Abstract

Artificial intelligence has been deployed to create competent music. Learning algorithms have been trained to occasionally create ‘interesting’ music. As yet, no artificial system has demonstrated a capability to create inventive or innovative music. The paper discusses a programme of research conducted to try and identify key aspects of what ‘innovative’ might mean. It then goes on to discuss similarities with AI research conducted outside the scope of music and begins a hypothesis that ‘wow’ composition in music has much in common with novel solutions evoking a wow reaction in people in other fields. A short end section suggests how this common ground might offer the potential for automated musical composition likely to evoke a ‘wow’ reaction in listeners.

## Introduction

The art of novel design is rapidly being turned into a science in a number of fields of human endeavour (Altshuller, 1984). Amongst a number of tangible tests of whether a given designed solution is likely to be viewed as innovative is the somewhat more subjective concept of ‘wow’. In discussions elsewhere (Mann, 2002) we have attempted to define ‘wow’ as a positive emotional response that draws a significant proportion of viewers or listeners to a novel creation, to the extent that they will seek to repeat that experience. The concept of ‘wow’ in music is perhaps even more subjective than it is in other fields of human endeavour, like for example industrial design or technology. Nevertheless, given the background of our extensive analysis of several million examples of ‘wow’ creation in other fields, we set about trying to establish whether such a phenomenon could somehow be reproducibly observed in a musical context. To this end, we designed a series of experiments as described hereinafter.

## Experimental Method

In many ways what makes a listener elicit a ‘wow’ reaction is very subjective. What makes a person experience a wow one day might leave them cold on another. There is, in other words, an issue of emotional context to contend with. In the first instance, then, we have tried to isolate such issues by including inputs from a wide variety of sources; partly through scanning the extensive music literature, and predominantly through access to large numbers of staff and students at an upper school in the UK. In all, over 90 people have contributed to the study, via a series of music lessons that spanned several hours of curriculum time. Participants were asked two basic questions:

- 1) identify pieces of music or musical moments that more often than not create and emotional wow for you
- 2) identify what it is about that piece or moment that caused the ‘wow’ moment to occur

Once thoughts and ideas were collated, they were discussed in groups within the class. The aim during these discussions was to obtain some form of agreement over which pieces of music did or did not constitute a general ‘wow’ classification, and then to agree the musical basis for that wow. Our starting assumption for the second part of this discussion was that ‘wows’ occur when something happens that the listener was not expecting to happen. Hence, for each candidate musical ‘wow’ the groups contrasted what they *expected* to happen against what the composer *actually did*. We can see the results of this comparison later in the results Table published elsewhere (Mann, 2005).

By way of an example, one of the ‘wows’ identified and agreed by a considerable number of participants was the composition ‘God Only Knows’ by Brian Wilson. The wow in this piece was deemed to occur between 1:04 and 1:28. What the listener was *expecting* to hear in the piece was either a contrasting bridge section or an instrumental over the verse accompaniment. What they actually heard was a completely unexpected four bar syncopated figure of customarily ‘Wilson – layered’ block chords. This leading straight into a polyphonic vocalised arrangement of the verse with contrasting melodies. Having identified this

‘wow’ moment, the authors then set about trying to establish whether this inventive leap fitted into the framework of leaps observed across other fields of creation outside of music.

### Systematic Innovation

At this point it is necessary to reflect on the findings of the extensive prior research conducted in other areas of innovation. Starting in 1946, around 2000 person-years of research has been conducted on patents, the sciences, social, political, marketing and other foci of human innovation. To date around three million successful innovations have been analysed. As illustrated in Figure 1, these analyses have revealed a considerable level of ‘re-inventing the wheel’; several million apparently unique innovations actually collapsing down to what is so far just 40 core ‘inventive strategies’ (Domb, 2005). This is not to say that there may not be more than 40 such strategies, but simply that whatever areas have been studied to date, these 40 and only these 40 are observed.

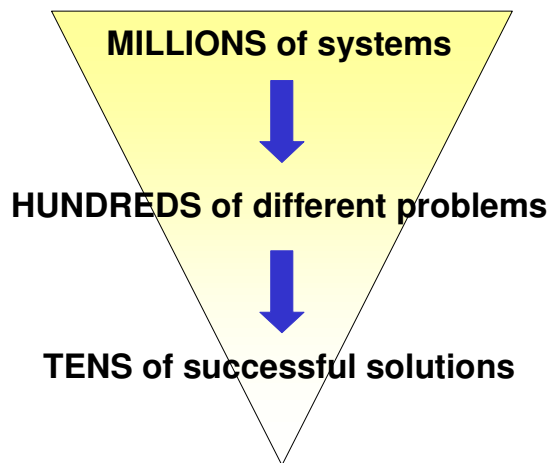


Figure 1: Key Systematic Innovation Research Finding

The essence of these 40 strategies is that they represent the only known ways of eliminating a conflict. In turn, it has been demonstrated that the elimination of a conflict (i.e. the viewer expects one thing, and then something else happens) lies at the core of ‘wow’.

### Systematic Innovation

Perhaps the first thing that becomes apparent from the results of the study is that in 100% of the cases analysed (close to 50 cases), the results demonstrated that the ‘wow’ was very definitely connectable back to one or more of the 40 known strategies. In the Brian Wilson ‘God Only Knows’ piece, for example, the use of syncopation and segmentation, relate respectively to Inventive Strategies 31 and 1. More specifically, then, we might begin to notice that not all of the 40 Principles are present in the list of examples. In fact there is quite a strong skew towards a relatively small subset of the 40. In descending order of

frequency, then, musical wows in our sample were most likely to be realised through Inventive Strategies:

- 19 – Periodic Action Shift
- 17 – ‘Another Dimension’
- 5 – ‘Merging’
- 35 – ‘Parameter Change’
- 13 – ‘The Other Way Around’

One aspect that seems to emerge from a helicopter-perspective view of the whole set of results is that there appear to be three basic categories of ‘wow’:

- 1) wows associated with a particular moment *within* a piece of music
- 2) wows associated with the overall structure of the piece of music, and
- 3) wows associated with high-level shifts *around* a given genre of music

What we have in these three categories is a sub-system, system and super-system view of the world. Thus, if we take a given individual piece of music and call it ‘the system’, then we can see wows associated with conflict resolutions at the system level. We can then zoom in and see wows within a piece of music (‘sub-system’) and wows that operate at a higher, ‘super-system level – where the conflict exists between a piece of music and its prevailing surroundings.

### Implications

In other fields of endeavour, the 40 inventive Strategies are already beginning to be used to design automated ‘creative leap’ algorithms (Mann, 2005a for example). From our initial findings here, we have seen no reasons why the same 40 Strategies, whether applied at the super-system, system or sub-system levels could not be integrated into an automated musical composition algorithm. This is an activity we plan to accomplish in the next phase of the research. We are actively looking for partners to participate in this future activity.

### References

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