

Clynes, Manfred

Mind-Body Windows and Music

Pütz, Werner [Hrsg.]: *Musik und Körper. Essen : Die Blaue Eule 1990, S. 19-42.* -
(*Musikpädagogische Forschung*; 11)



Quellenangabe/ Reference:

Clynes, Manfred: Mind-Body Windows and Music - In: Pütz, Werner [Hrsg.]: *Musik und Körper. Essen : Die Blaue Eule 1990, S. 19-42* - URN: urn:nbn:de:0111-opus-92615 - DOI: 10.25656/01:9261

<https://nbn-resolving.org/urn:nbn:de:0111-opus-92615>

<https://doi.org/10.25656/01:9261>

in Kooperation mit / in cooperation with:



<http://www.ampf.info>

Nutzungsbedingungen

Gewährt wird ein nicht exklusives, nicht übertragbares, persönliches und beschränktes Recht auf Nutzung dieses Dokuments. Dieses Dokument ist ausschließlich für den persönlichen, nicht-kommerziellen Gebrauch bestimmt. Die Nutzung stellt keine Übertragung des Eigentumsrechts an diesem Dokument dar und gilt vorbehaltlich der folgenden Einschränkungen: Auf sämtlichen Kopien dieses Dokuments müssen alle Urheberrechtshinweise und sonstigen Hinweise auf gesetzlichen Schutz beibehalten werden. Sie dürfen dieses Dokument nicht in irgendeiner Weise abändern, noch dürfen Sie dieses Dokument für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, aufführen, vertreiben oder anderweitig nutzen.

Mit der Verwendung dieses Dokuments erkennen Sie die Nutzungsbedingungen an.

Terms of use

We grant a non-exclusive, non-transferable, individual and limited right to using this document.

This document is solely intended for your personal, non-commercial use. Use of this document does not include any transfer of property rights and it is conditional to the following limitations: All of the copies of this documents must retain all copyright information and other information regarding legal protection. You are not allowed to alter this document in any way, to copy it for public or commercial purposes, to exhibit the document in public, to perform, distribute or otherwise use the document in public.

By using this particular document, you accept the above-stated conditions of use.

Kontakt / Contact:

peDOCS
DIPF | Leibniz-Institut für Bildungsforschung und Bildungsinformation
Informationszentrum (IZ) Bildung
E-Mail: pedocs@dipf.de
Internet: www.pedocs.de

Digitalisiert

Mitglied der


Leibniz-Gemeinschaft

**Musikpädagogische
Forschung**

**Werner Pütz
(Hrsg.)**

**Musik
und Körper**

D 122/90/11/2



Themenstellung: Daß es der Leib ist, der die Musik macht, hört und erlebt und daß jeder Umgang mit Musik geistige, emotionale und körperliche Prozesse gleichermaßen mit einschließt, scheint eine Selbstverständlichkeit, die jedem Musiker, Musikwissenschaftler und Musikpädagogen vertraut ist. Trotzdem ist das Verhältnis vieler Musiker und Musikologen zu ihrem Körper nicht ohne Irritationen, Folge einer leibfernen musikalischen Ausbildung, die ihrerseits die im Verlaufe ihrer Geschichte zunehmende Entkörperlichung der abendländischen Musik und Körperfeindlichkeit der westlichen Kultur insgesamt widerspiegelt.

Die im vorliegenden 11. Band der Musikpädagogischen Forschung versammelten Beiträge des Cloppenburgers Symposions „Musik und Körper“ gehen die elementare Beziehung zwischen Leib und Musik im interdisziplinären Dialog an. Pädagogen, Wissenschaftler, Therapeuten und Künstler reflektieren das Thema aus musikpsychologischer, anthropologischer und philosophischer Sicht, entwerfen Modelle zu einer ganzheitlichen, körperbewußten Instrumental- und Gesangspädagogik (Alexander-Technik, Feldenkrais-Methode, Klavierunterricht im 19. Jahrhundert) und stellen Beispiele künstlerischer Praxis vor (Chinesische Nationaltänze und Performance Art); sie diskutieren Fragen der pädagogischen und therapeutischen Praxis und Theorie (Musikhören; Regulatives Musiktraining; elementares „leibhaftes“ Musizieren; Afrikanisches Trommeln; Musik und Bewegung, Rock- und Pop-tanz im Musikunterricht; Körperbewußtheit und musikalische Interpretation). Außerdem enthält der Band zwei Beiträge zur Musik in der Erwachsenenbildung.

Der Herausgeber: Dr. Werner Pütz, geb. 1939, Studium der Schulmusik, Germanistik und Musikwissenschaft (Musikhochschule und Universität Köln), Professor für Musikpädagogik an der Universität Gesamthochschule Essen, Veröffentlichungen zur Didaktik der Neuen Musik, zum fächerübergreifenden Unterricht und zu therapeutischen Aspekten des Musikunterrichts.

ISBN 3-89206-351-6

Musikpädagogische Forschung

Herausgegeben vom Arbeitskreis
Musikpädagogische Forschung e.V.

Band 11

Werner Pütz
(Hrsg.)

Musik und Körper



CIP-Titelaufnahme der Deutschen Bibliothek

Musik und Körper / Werner Pütz (Hrsg.). -
Essen : Verl. Die Blaue Eule, 1990

(Musikpädagogische Forschung ; Bd. 11)

ISBN 3-89206-351-6

NE: Pütz, Werner [Hrsg.]; GT

ISBN 3-89206-351-6

© Copyright Verlag Die Blaue Eule, Essen 1990

Alle Rechte vorbehalten

Nachdruck oder Vervielfältigung, auch auszugsweise,
in allen Formen, wie Mikrofilm, Xerographie,
Mikrofiche, Mikrocard, Offset, verboten

Printed in Germany

Herstellung:

Merz Fotosatz, Essen

Broscheit Klasowski, Essen

Difo-Druck, Bamberg

„Das diesem Bericht zugrundeliegende Vorhaben wurde mit
Mitteln des Bundesministers für Bildung und Wissenschaft
(Förderungszeichen: B 3786.003) gefördert. Die Verantwortung
liegt bei den Autoren.“

Inhaltsverzeichnis

Vorwort	9
AMPF-Tagung Cloppenburg 13.-15. Oktober 1989	15
MANFRED CLYNES	
Mind-Body Windows and Music	19
RUDOLF ZUR LIPPE	
Es ist der Leib, der die Musik macht	43
CHRISTOPH SCHWABE	
Regulatives Musiktraining und Körperwahrnehmung	56
WERNER PÜTZ	
Erfahrung durch die Sinne und Sinnerfahrung. Perspektiven für den Umgang mit Musik	65
BARBARA HASELBACH	
Zur elementaren Erfahrung leib-haften Musizierens	83
RUDOLF KRATZERT	
Alexander-Technik als Basis-Technik für Musiker	87
PETER JACOBY	
Die Feldenkrais-Methode im Instrumental- und Gesangsunterricht	99
MARTIN GELLRICH	
Die Disziplinierung des Körpers. Anmerkungen zum Klavierunterricht in der zweiten Hälfte des 19. Jahrhunderts	107
WENJUAN SHI-BENEKE	
Chinesische Nationaltänze Musik- und Tanzstile verschiedener Regionen	139
GERTRUD MEYER-DENKMANN	
Performance-Art - Versuch einer Orientierung	166
HEINER GEMBRIS	
„For me, it’s a little microcosmos of my life“ Über die Performance von Jana Haimsohn	179

FRAUKE GRIMMER		
	Körperbewußtsein und „innere Bewegtheit des Ganzen“	
	Voraussetzungen lebendiger Interpretation in der Musikpädagogik	
	Heinrich Jacobys	185
WOLFGANG MEYBERG		
	Afrikanisches Trommeln. Aspekte einer körperorientierten	
	Musikpädagogik	198
ULRICH GÜNTHER		
	Musik und Bewegung in der Unterrichtspraxis.	
	Bericht über eine Befragung von Musiklehrern	205
RENATE MÜLLER		
	Rock- und Poptanz im Musikunterricht.	
	Musikpädagogische Aspekte	223
HORST RUMPF		
	Sinnlichkeit - Spiel - Kultur	
	Erinnerung an verpönte Spiel-Arten	234
URSULA ECKART-BÄCKER		
	Musikpädagogik in der Erwachsenenbildung - eine gesellschaftliche	
	und pädagogische Notwendigkeit:	
	Einführung in die Problematik	246
WERNER KLÜPPELHOLZ		
	Erwachsene als Instrumentalschüler	
	Eine empirische Studie	263

Mind-Body Windows and Music

MANFRED CLYNES

Introduction

I should like to thank the organizers of the symposium concerned with the relationship between body and mind in music for their invitation to contribute this article. My regrets are only that I could not attend the symposium personally.

Mind-Body Interaction

The inherent connection between the psyche or mind, and the body, is surely one of the most important unresolved questions, made increasingly urgent in our time with continuing technical progress. Because of its difficulty and apparent intractability it is frequently swept under the carpet even by foremost theoreticians - in artificial intelligence, in neuroscience, human ethology, social biology and philosophy.

In none of these disciplines have handles been found to attack this question. Clinical psychology and psychiatry, encountering the question empirically through the use of substances which affect the mind and the psyche have little understanding as yet of how, and not at all why thought influences the body and vice versa (Panksepp 1982, 1988, Panksepp, Silvy, and Normansell, 1985, Pert et al., 1984). We don't know even how alcohol affects the mind in the way it does.

Curiously however, the field of dynamic emotion generation and communication (Clynes 1988, 1980, 1977, 1973, 1969), and one of its off-shoots the art of music, can provide us with the strongest and simplest evidence of inherent links - windows - between the mind and the body; and can subject details of their nature to experimental evidence and to differentiated personal experience. Consider the following:

It is not clear where and how the command to lift one's finger, say, *originates*, within the brain. But it is very clear that one can lift it 'this much', or less, or more, by a simple, uncomplicated act, at one's choice and a time of one's choice.

This simple act is easy - and a simple and perfect example of interaction of the mind and body. It is an elementary action, termed a '*voluntary* action' (a nomenclature in which hides the concept of 'will'). The mind is also informed by the nervous system that the action has taken place, according to its command, through kinesthetic sensing. So for this elementary action (which we have termed an '*acton*', Clynes 1969, 1973, 1977) there is a clear mind-body-mind interaction.

Essentic forms as inherent mind-body windows - three additional inherent paths

But such an action can be readily transformed to have an entirely different connectivity between psyche, mind and body than we have just described: such an action can also be carried out as an *expressive action*. If that part of the body is moved with *intent* to express, and moreover to express a particular quality of feeling (emotion), then interestingly, an additional mind-body interaction is *inherently* brought into being. Now that is very remarkable, and needs to be clearly described.

Additionally connected to the body now is the 'emotional state', not just the 'voluntary motor mode'. It is the emotional state which determines the *precise trajectory* of the movement, if it is to be expressive of it. Moreover, the psyche or mind knows whether the expressive form has been correctly carried out - a totally different agency of the mind (involving the amygdala, we can presume, Aggleton & Mishkin, 1986) is involved in this, in addition to that involved in the simple movement described first. This second, parallel, path is psyche-mind-body-mind-psyche, and the interaction occurs over the time span (different for different emotions, in the range of 1.5-10 sec) taken by the trajectory, with the reverse (body-mind-psyche) path active largely towards the end of the trajectory of the expressive act. We have termed such expressive actions *E-actons* (Clynes, *ibid.*).

The significance and theoretical importance of this path, involving the dynamic shapes of the expression of specific emotions, is increased by its direct inclusion of time: this mind-body-mind window includes a psychobiologic clock by its nature. This clock appears to be integral to the window, and to be operating at a rate set for humans as a species, ie. is genetically determined (see also Clynes & Walker, 1982, 1986).

Most importantly also, such action has the capacity to *augment* the intensity of the state of emotion which it is expressing - or, after many such expressions to diminish its intensity, 'satisfy' it. This can be seen to constitute a third body-mind-psyche path (blocked in mimicry). So there are at least two additional paths between the psyche, mind, and body involved here compared to the simple voluntary action (acton). (Note especially that we are not talking here of any sensing of changes of physiologic variables, like heart rate, sweating, perfusion of circulation and so on. Feeling these may constitute additional body-mind interactions which are of a different kind, and are auxiliary in the sense that they are not directly simultaneous or coupled with the motor expression - they are generally mediated by sympathetic and parasympathetic activation related to the emotion state, but not directly to specific expression.)

But there is still a fourth path of a mind-body-mind interaction directly and inherently linked to the motor expression of an emotion. This is manifest whenever a motor expression is attempted. It is a change in the accustomed feeling of such motor action. In grief, a sense of heaviness pervades, more 'effort' is required. In joy, there is an unaccustomed lightness (less effort). These mind-body interactions are of a different kind from the first two. Contrary to those described before, they do *not* depend on the trajectory, and are independent of how well the expression is carried out - they apply to all attempted motor actions, and even to imagined ones (we have termed these important mind-body-mind functions 'virtual body images' specific to particular emotions, Clynes 1973, 1977, 1980).

The body in imagined expression - unseen and unsensed molecules that respond to thought

It is especially notable, that all the mind-body interaction paths described in relation to emotional expression can also function to a considerable extent with the imagination only, that is, with a clearly imagined motor expression - imagined with its appropriate dynamic trajectory. (We have in fact seen that entire musical pieces can be performed mentally, with a high degree of timing precision, Clynes & Walker, 1982, 1986). In what sense can we then, in the case of imagined expression, talk of a body-mind path? We need clearly to differentiate between imagining an emotional state, and imagining the motor expression of that emotion. When that expression is clearly imagined *in its time course* the path can

function in a way rather similarly to its function with actual expression. It would seem that the parts of the brain involved in shaping the emotional expression, the amygdala and the cerebellum, could be activated by *imagined* expressions, in some way; and/or possibly some other structures in the brain could take over aspects of that role, as also may happen in dreams, in which the quality of emotional expressions can be vividly felt. (It is possible, at times to think music in a kind of temporal shorthand - Mozart is said to have been able to think a symphony through in one minute - in that case of course the body does not react in the same way, but that does not imply that there is no reaction at all.) In dreams, of course, the mind-body and psyche-mind paths are quite altered, and so is the time frame in a number of ways. Very little is known about how this alteration takes place.

We need to mention a further important and most remarkable interaction of thought with the body: the strong and specific influence of thought on the blood flow pattern to localised parts of the brain, increasing blood flow to those parts especially concerned with the type of thought taking place. We may expect such patterns also to be very emotion-specific, and to thus also change with musical meaning.

Further, to conclude a brief survey of mind-body windows that we consider to exist, a specially interesting window is the action of intention on the focal length of the lens of the eye: the accommodation regulation. Here also, as in blood flow regulation to specific parts of the brain, there is a mind-body but no body-mind window, as we do not sense the action of changing focus as a motor action, only in terms of what we see, it is thus in a sense a one-way mirror rather than a window. Yet our mental intention is accurately reflected by a specific part of the body, the lens, effortlessly, except for eye movement: the sensation of muscular effort is absent, as it is 'one way mirror'.

These interactions are different from those involved in urinating, in salivating, or in other body functions which involve specific stimulus sensations, interactions in which the mind is not comparably free.

(All these mind-body windows we have considered involve the motor system. We seem to acknowledge mind-body interaction only when there is an observable motor system output. This however is a rather strange limitation, if one considers it further. It is similar to the habituated notion that a child begins life at its birth: when you can *see* it. If mind can influence body as evidenced by visible or electro-

physiologically visible signs of motor response - in 'normal movement' observable outside the body - is it possible that internal mind-body interactions *not* confined to the motor system may exist? If mind can direct via the motor system, as we know it can, in that process certainly there are biochemical stages of neurotransmitters and neurohormones involved. The mind can control the production of some of these in a not yet understood way. Then what is to prevent mind the possibility of controlling other systems than the motor system (voluntary and involuntary) through neurochemical means? That this occurs is evident for example in the sudden acceleration of heart rate in fear, the erection of the sexual organs in response to mind images, real or imagined. Although one would not *habitually* think so, other *not* directly observable interactions might well occur. Such interactions might seem rather miraculous. But we should not forget that just the lifting of the little finger voluntarily is already similarly miraculous - and will be until the central issue of mind-body interaction is elucidated. We are used to the miracle - as we are used to the 'miracle' of magnetism, say - because we *see* it every day, and because we experience the reverse path, the body-mind 'kinesthetic' interaction with which it is bound. But the mind-body interaction in focussing the lens of the eye, or the specific blood flow regulation of the brain has no such a reverse path (though they involve motor activation). They should seem rather miraculous (a 'first order miracle', one could say). Neither would all direct internal mind-body windows not connected with the motor system. If they exist (as 'second order miracles' since they don't involve motor systems at all: no forward and no reverse motor system path), the language of music is surely knocking right on their doors.)

The mind and the psyche

It is not easy to differentiate appropriately between these two concepts, mind and psyche. (Psychologists nevertheless would probably not like to be called Mindologists). One way would be to call psyche that aspect of human existence, of the unitary being of an individual, which continues in a relatively unchanging condition from moment to moment, and over the years and even and especially in dreams. It is at the present time not feasible to account for the interaction of the psyche and the mind, if these indeed are two separate viable concepts. For that reason we shall talk about the 'mental world' - including emotion and the

unconscious - without special reference to psyche except at such times when it seems clearly necessary to do so.

It is also necessary in context of music to say that the concept 'soul' has been banished from neuroscience almost universally. It would be difficult in today's understanding of the biological basis of brain function through DNA to hold that humans and not other animals have a soul which enters and leaves the body at some time. The majority of those who hold onto the concept of a soul on the other hand seem to find it untenable to expect animals also, from chimpanzee to ants - not to mention bacteria, to have souls that enter and leave the body at some time. We need to refer to this since the greatest of music has been held, not meaninglessly, 'to touch the soul', is of religious character even, in a natural sense; and we shall, to a degree, explore what that implies, since it reflects on the body-mind problem. So we may say initially that the best music affects man integrally from the most fundamental or deepest level to the mind and the body - and leave it to later development in this paper to see what this may mean. Might music even shed some light on this question?

The language of music: how does it involve the body?

Expressive action is, as we have noted, both hierarchical and reciprocal. The nervous system has both afferent and efferent pathways and is hierarchically constructed so that it can be controlled from many levels; some not requiring consciousness. Consequently also, the expressive action of music engenders afferent and efferent co-ordinated interactions on many levels which together constitute an important part of music experience. Such expressive functions relevant to musical language, including those of many neurohormones, occur on a time scale of a few seconds.

On longer time scales occur a number of cumulative effects of varied forms of arousal: involving circulating hormones and cardiovascular and respiratory function: these may be considered however not to be direct properties of musical language, but rather *cumulative* effects of what is said in that language, functions of the kind of passion inherent in the music, and reflected in the listener. (Music also may evoke emotion because of association with particular events and experiences in memory of the listener. Such idiosyncratic effects are not properties of the language of music itself.)

Music is the language of emotions, par excellence, according to Yehudi Menuhin. Many musicians, though not all, would agree. Let us then look more closely at what 'language' means here. If music is a language of emotions it is *about* emotions. But, curiously, being *about* emotions it also induces emotion. How does it do that? Here we touch the essence of the biological secret of communication design. In the biologic transmission of an emotional quality the meaning and transmission are co-designed: the more precisely one "talks" about an emotion the more powerfully it is transmitted. The quality (and meaning) of the emotional message becomes more powerfully transmitted the more precisely in analog form it is encoded in the message. *In this method, natural design is much more advanced than humanly designed transmission systems which transmit meaning or lack of it equally well!* With sound, hearing is the receiver, and motor output through the voice, or a musical instrument, is the sender. The sense of touch, too, can be used to contagiously transmit dynamic emotional qualities. *Meaning-sensitive filters are inherently built into the biologic system*, so that some, in fact most, dynamic forms tend to be ignored, but others have specific emotional meaning - rather like the 'innate release mechanisms' described by ethologists.

Essentic forms, as they have been termed (Clynes, 1969) - forms in time programmed into the nervous system - are incorporated into the biologic modulation and filter design (apparently centrally involving the amygdala in their perception and execution, Aggleton & Mishkin, 1986) so they, and only they among dynamic forms, express and impress the emotional qualities to which they belong, for specific basic emotions (see also Hama & Tsuda, 1989, 1990). These forms can be used in touch or in sound; the motor system produces the form. Their production is largely under voluntary motor control.

Through the production and recognition of these *dynamic* forms, naturally coordinated by the nervous system, nature has made it possible to transmit emotional qualities contagiously from one individual to another - and for an individual, to 'talk' to himself in terms emotional qualities. Such inherent mind-body interaction involving specific dynamic forms is biologically determined, a biologic given (Clynes, 1969, 1973, 1977, 1980, 1988).

We are all familiar with such contagious forms for yawning and for laughter. For a number of emotions (anger, hate, grief, love, sex, joy and reverence) - not for the so-called 'social emotions', which are probably less biologically determined, eg. embarrassment, and also do not find much place in music - the corre-

sponding forms have been identified and discovered as universals through sentographic experiments (Clynes, 1969, 1973, 1975, 1980, 1988, Hama & Tsuda 1989, 1990).

(In an earlier review in these volumes, Behne (1982) takes a critical view of the imputed universality of these forms, referring to the variety of styles and interpretations of music, none of which can be held to be *best* in an absolute sense. This is a mistaken objection, since the production of language elements always occurs in a context, and the context is argely free, so that no two interpretations are alike, nor does perfection of elements per se guarantee a great performance: it is a necessary but not sufficient condition; it says nothing about the interpretive choice, which is a function of the individual performer, and style. Moreover, culture influences what particular sound parameters shall be used to embody essentic form.)

Cognitive substrates of specific emotions

The interaction between the emotional "word" - the essentic form - and the body is not limited to engendering the experience of an emotional feeling. Along with the experience of a feeling go what we call inherent 'cognitive substrates' of specific emotions. That is, our worldview and various specific modes of thinking, even mental functions, are directly influenced by the feeling, in a *choiceless* manner (Clynes, 1986). Recent experimental work (Clynes, Jurisevic, and Rynn, 1990) has shown, for example, that the emotion of love inherently is linked with truthfulness and openness - lying blocks love. (Guilelessness and openness are shown to be part of the nature of love itself, scientifically - this guilelessness is therefore implied whenever such love is expressed in music). Similarly, hate engenders distrust; grief, hopelessness, isolation, and forgetting of new experience; joy, carefreeness, and so on. These cognitive substrates, and others, are thus an essential part of *musical meaning* also. They contribute much to the meaning of the unspoken story.

These substrates too are reflected in potential bodily interconnections.

Perspective and detachment: Dionysian vs. Apollonian experience and expression

Essentic form is universal not only among humans. Man appears to share many aspects of the communication of emotion with the higher animals. Most of us have experienced sharing joy, anger, grief, and even love with their dog, say, by means of expressions using essentic forms - in the tone of voice, in gesture, in the touch, in praise and blame.

But humans have an additional faculty of detachment which animals are not known to have, in spite of their playfulness, especially when young: this may be clearly noted in laughter. Laughter requires mental detachment that seems beyond the ability of animals - but more than that, it is undoubtedly a genetically novel faculty. However, the emotions of music can also be viewed with detachment similar to that necessary for laughter. Music as a language of emotions can 'talk' about emotions in two ways - as ego-functions, the Dionysian way, or, as a language of *existences* not attached to the ego: the Apollonian way. There are correspondingly two quite different ways of incorporating emotion into music and communicating it, and consequently two ways in which music interacts with the body - over and above all what we have discussed before. Man has control over which way he uses. The two ways do not differ in the dynamic forms they use, the 'words', but in the *point of view* from which they are seen. This distinction is of great significance to the performer of music.

Compare the conducting of Toscanini or of Casals with the jumping and ranting about of a rock and roll performer, or the body movements of certain well known conductors. A glance from Toscanini had more power than the gyrations of many an idolised rock star. Only, the power was applied at a different point in the emotional control system. Toscanini was passionate, more so than perhaps anyone that comes to mind. The difference lies in the point of view. With the Apollonian view, the emotions are regarded from the perspective of the totality of the human condition: the passion is directed at that. Apollonian music is arousing but in a different way from Dionysian.

No longer is arousal considered to be a one dimensional phenomenon as it was in the days of Schachter and Singer's theories; today it is seen as very differentiated. The body reacts in regionally different ways, with different kinds of autonomic, sympathetic and above all neurohormonal influences. An interesting way to consider such different body involvement with different types of music is to compare it to the Indian notion of chakras. Different types of music, exemplified

also by different composers may be felt to 'center' around different levels of the body axis, or spine.

To consider more closely the difference between the Dionysian and Apollonian ways, in detail, the experience of sentic cycles becomes very helpful.

Sentic Cycles

Sentic Cycles is the name for a simple art-form of touch developed by the author which has had considerable ramifications. It makes use of essentic forms as does music, but expresses these in shapes of touch. A person sits quietly and expresses on a finger rest with transient pressure of the middle finger of one hand, the particular emotion called for. The pressure is felt to originate from the trunk, not from the finger by itself. The sentic cycle *generates* a series of emotions in the person: each emotion is repeatedly expressed, and this *reiteration of the appropriate form itself largely causes the emotion to be generated*.

The name of the emotion is announced on the tape, and is followed by a series (25-40) clicks indicating when to express that emotion. Importantly, for each emotion there is a biologically most effective timing. This timing is provided on a tape, by soft clicks, one click for initiating each expression. Machine-like regularity in the timing is counterproductive - the intervals are artistically designed not to be predictable through including small amounts of quasi-randomness (see Clynes 1988 for timing details). After the series of expressions, the tape announces the next emotion, much like a composer might write 'dolce' or 'con fuoco' and expect the performer to express just that. Each emotion has such a series of expressions. The entire sequence, consisting of No emotion, Anger, Hate, Grief, Love, Sex, Joy and Reverence last 27 minutes.

Switching Emotions in the Sentic Cycle

Characteristic about the sentic cycle experience and function is not only that it is readily possible to feel all the emotions, but also that the *switching* from one emotion to the next is accomplished easily. This of course has immediate application to musical performance: the musician has to change his feeling at the whim, at the command of the composer, at a time scale quite different from that of real life. How to do that is not taught: sentic cycles, however, increases the

fluidity, the ease of deliberately changing emotion. This is helpful for individuals who may be in a 'rut' emotionally, being stuck in one emotion; as a therapeutic measure.

Doing Sentic Cycles is easily learned - it takes perhaps fifteen minutes. No musical talent is required. The benefits are obtained right from the beginning, often at the very first session. These include a calmness combined with energy, absence of anxiety, effects which are not ascribable to the pronounced relaxation which takes place, but to the sense of being in touch with one's emotions, a feeling of wholeness and centeredness. Importantly, the emotions are experienced as one's own, not those dictated, however benevolently, by a composer. It is thus more akin to musical improvisation, a faculty which is unfortunately not widespread in our time.

In Sentic Cycles the body becomes very quiet. It thus provides a unique opportunity to allow the person to focus on the body sensations which accompany each emotion, to experience the virtual body images without interference of distracting motion and events. In this way a person not only learns to differentiate these well, but also has a rare opportunity to distinguish between Dionysian and Apollonian expression and experience of each emotion. (It is a surprise, when that person discovers, that reverence seemingly paradoxically exists only in Dionysian form, as ego function!)

For musicians, the benefits of sentic cycles also includes the absence of nervousness before a performance, if they do a cycle an hour or so before the performance. Usually, a performer needs some time to 'get into' the performance emotionally when being on stage; initially often nervousness and anxiety predominate, if not outright fear. Having done sentic cycles, one is already *in* the performance, so to speak, in touch with emotion, as if one had already played the first half of the concert.

But even more significant is that the practice of Sentic Cycles give one ready access to essentic form, that when playing music one knows how the phrase in accordance with essentic form, and that one thus can have *real confidence that what one is expressing will be experienced as moving by the listener*. As Goethe said, only if one is moved oneself can one move the listener: knowledge of essentic form and practice of sentic cycles allows one to be moved without the danger of uncontrollably losing oneself in emotion, it allows one to savor each emotion, to take out each emotion from one's pocket as one needs it and put it as it were, back when one is ready for the next one, yet feeling each genuinely.

Musical Meaning, The Double Stream of Music, and the Body

Musical meaning includes both the emotional quality of the musical 'words' and their cognitive substrates. Accordingly, the musical meaning may be thought to be comprised of a story built from emotionally significant 'words', ie. essentic forms, together with their cognitive substrates. But this description of the process of musical meaning is far from complete.

As the story of the music unfolds as a chain of varied essentic forms, simultaneously there is a second continuing process, the musical pulse. The pulse is repetitive and has specific microstructure.

This double stream characterises western music (Clynes, 1983, 1985, 1986, 1987). One continuing and varying stream tells the emotional story, and the other repetitive, persistent pattern in western classical music identifies *who* tells the story - provides the intimate personal identity or presence of the composer. In ethnic music the pulse provides national or regional identity and character.

The microstructure of the pulse effects the articulation *within* the beat. There are systemic deviations from arithmetic note values of the written notation and also systemic variations of relative loudness within the beat that constitute the particular pulse microstructure for that composer or ethnic pulse.

The pulse microstructure also translates into movement, and into body condition; massiveness in Beethoven, freedom in Mozart, springiness in Haydn, being pulled upward within every pulse in Schubert, pulling up a weight in Mendelssohn, upward swelling in Schumann. The gestures that correspond to the pulses of each composer also parallel the corresponding virtual body images. Thus for a conductor, for example, the subtle postures of the body and arms will be different for each composer, on the whole, reflecting the character of the pulse.

Composer's pulses were first measured sentographically, with data from artists including Pablo Casals and Rudolf Serkin, who as experimental subjects expressed the pulse on the sentograph while thinking the music in real time, without sound (mentally rehearsing the music) (Clynes 1969). This expression of the pulse however did not tell us how the pulse is embodied in the notes of the music. This we discovered first in 1983, by means of computer synthesis. The pulse was seen to be made manifest in the music through a combined time and amplitude warp pattern, specific for each composer, termed the pulse matrix (Clynes 1983, 1985, 1986, 1987). This pulse microstructure can be compared to an

extent to a person's gait, which is very much his own, and from which he can be recognised. However, the musical pulse also and primarily portrays an intimate 'point of view', specific to the composer (a kind of *Weltanschauung*).

For a detailed description of the composer's pulses the reader is referred to Clynes 1987 and 1986.

Considering a composer's music as a whole, we may note that the virtual body images related to the inner pulse will tend to center about certain chakra levels, differently for different types of music. We may now see (Clynes 1983, 1986, 1987) that this level is determined primarily by the subtle microstructure character of the inner pulse, which contributes to its meaning. Rock tends to come from the first, lowest level, below the navel, romantic music higher, Schumann midbreast, Beethoven (before the last period) from near below the neck, Mozart a little higher, around the middle of the head, Bach higher than the eyes, at the level of the top of the head (cf. the 'third eye') or somewhat above the head (such a projection is physiologically conceivably possible: compare for example Bekessy, the Nobel prize winner's experiments with vibration controllably projected to feel to come from specific locations several feet outside and in front of the body. He used stereo-vibration stimulation through variably phasing two vibrators, one touching each side of the body; after all we *hear* sounds as coming from specific locations outside our bodies, not touching our eardrums which is what they really do - an equally remarkable achievement).

Why does musical rhythm not drive animals?

While it is clear that man has such power to express, communicate and experience emotion through music, and the emotion becomes contagious, this contagion does not reach animals, not even through powerful rhythm. That this is so presents a considerable scientific mystery, a problem which intrigues this author considerably. No dog ever dances spontaneously to rock and roll, even at its loudest! Why not? Although some people might hold that a dog is too intelligent to do it, it would seem to be clearly not a matter of intelligence. It appears that timeform printing in terms of sound is not congenial to a dog (although it does it readily in bounding, in whipping his ears, and in digging in the sand, and so on. When barking, a dog seems to produce a sequence of essential forms rather than the rhythm of time form-printing; it is sufficiently varied even when repeated,

with irregular small (or larger) pauses in between, not to be perceived as driven by a beat, even though it can be persistent!).

Hemispheres, the Body, and Musical Function

Parallel to the division of function between the brain hemispheres there is also a natural tendency for the pulse to be expressed primarily with the right arm, while the emotional story of essential forms tends to be more the province of the left arm. However, this division is not absolute. Some emotions appear to be centered more in the left hemisphere and others more in the right hemisphere (Davidson, 1983, Clynes 1973, 1975). Strong and aggressive rhythms will tend to favour the right arm and right handed individuals, joyful expressions and rhythms will tend to be symmetrical involving both left and right arms, gentle, sad expressiveness will tend to favour the left arm more.

This should not be confused with the experience of the virtual body image which is generally symmetrical with respect to the body, for example lightness and heaviness or abdominal tension is normally felt on both sides of the body.

Rhythm appears to be predominantly a left hemispheric function while melodic expressiveness involves more of the right hemisphere (eg. Borchgrevink, 1982), although this may vary with to the emotional quality of expression. We may see that it appears that in the double stream of music the pulse represents a left hemisphere predominance while the emotional story as expressed in melody and essential form is both a right hemisphere and left hemisphere function, with a degree of predominance depending on the emotional content.

A further factor is ear dominance which does not always parallel motor dominance. Higher pitches tend to be favoured by the right ear, lower pitches by the left ear (as in the piano construction), in terms of dominance though not in terms of threshold.

In listening it is desirable to have melodies come preferentially from the left side of the stage (eg. first violins); this makes them more available to the right hemisphere. Strong rhythmic instruments should not be placed predominantly on the left side of the stage.

This natural division of left and right hemisphere function, however, does not always sit well with the design of musical instruments. Thus for example the

rhythmic pulse is often predominantly handled by the left hand on the piano; and the left hand is seldom given the opportunity for lyrical expressiveness. A string instrument however gives the right arm a greater share in rhythmic articulation, while the left arm and hand have an important role in lyric expression in terms of vibrato and pitch height, as well as the right arm. Thus in these respects string instruments may be more natural than the piano.

Force, Intensity, and Expression

Intensity of emotion and loudness do not necessarily increase together. Intense love (non sexual), for example, does not require correspondingly increased loudness, on the contrary intense love is quite compatible with a soft and gentle expressiveness. The intense loudness of some popular music such as rock derives from a different source, the need to obliterate all other sensory inputs. This is achieved not through irresistible meaning but through sheer sensory flooding, or overload.

On the other hand, the natural properties of essentic form to augment the intensity of an emotional state with repeated expression often result in a crescendo, which parallels the increased intensity and abandon of the state, as also in approaching orgasm, and conversely, a diminuendo often portrays the receding of this. In other instances these may portray rather a spatial approach and departure. The bodily conditions for these two different ways are also correspondingly different.

All instruments, and also the human voice are designed to produce increased sound volume with increased muscular force, and to a degree increased effort. (We take this connection for granted - however: one could now simply design an instrument (with electronic controls) where playing softly would demand the greatest effort! Playing with that would instruct us to appreciate our natural proclivities!) With a number of emotions, such as pain, or longing, there is a natural relationship between intensity of feeling and the loudness with which it may be expressed, as is also evident in the cries of animals. The dynamic range of these however are different for different emotions. For other emotions, also in animals, loudness is not a correlate for intensity. An animal courtship dance or song is not simply most successful in proportion to loudness. There is thus no general one to

one correspondence between loudness, intensity of feeling, and sense of effort, valid for all emotions. Moreover, because of the specific virtual body images for various emotions, the effort is of an entirely different character for various emotions, involving the sensing of different body regions.

Expressing the Double Stream with Two Sentographs

The double stream of music discussed in the above can be well expressed using two sentographs, expressing the pulse with the right arm on one sentograph, and the unfolding emotional story with the left arm on a second sentograph, as a succession of essentic forms (Clynes & Nettheim, 1982, Clynes 1977). Carrying this out is a remarkable experience, providing a emotionally vivid and vital recreation of the music - without sound. This is also a highly educational means to get a better, intimate and more complete understanding of the music.

The musical performer

A good musical performer hears *before* he plays - he has to have a clear idea inwardly of what he plays.

He needs to:

1. Hear inwardly first.
2. Clearly execute what he hears inwardly.
3. Listen to check what he plays is what he hears inwardly.

These three functions go on continuingly and simultaneously! Not on easy task!

As his interpretation grows in time, the inward idea of the sound becomes clearer, and its execution becomes more precise. A "clear idea and its precise executions" involves not just the character of every single note, but includes fractions of notes, smallest silences. The quality of feeling guides the performer on just what such microstructure should be: there is a one-one correspondence between the microstructure and the feeling. Being aware of the feeling is therefore the guiding principle; refining the emotional meaning, and sensing when that feeling has been faithfully expressed. That means the second path of psyche-mind-body-mind-psyche, of which we spoke at the beginning must come into play continuingly. Without this path music is but a dry exercise.

In this sense performer becomes one with his instrument. Instead of only the kinesthetic path there is the second parallel path, continuously active. Not a single note should be meaningless: the hearer notices when this chain - the stream of varying essentic forms - is broken. Silences are equally significant to the notes in meaning: the pulse continues in silences: a Mozart or a Beethoven rest will carry their own, quite different, inner pulse, for example. Silences can be part of essentic forms too.

Motor System Function by the Performer

What may we say then about the motor system function of a good performer? Relaxation is an insufficient description. The first important requirement is a complete *freedom* to move in any manner required by the musical meaning, the emotional quality of every phrase not just the technical requirements. This freedom does not mean that large movements need to take place: even for the smallest movement, the freedom is equally important. Freedom does not tell you what to do but allows you to move creatively, as the inner thought requires. In some ways this is rather similar to the Zen Buddhist tradition of emptying your mind. You empty your mind-body. Then you are able to shape it freely and naturally, and effortlessly. Sentic cycles are very helpful for this.

In shaping any movement harmoniously it is best that a movement is felt to originate from central regions rather than the extremities: Casals used to teach that all movement originates in the torso, centrally: this is also in accord with Feldenkrais methods, as well as the ancient Indian concept of *Cath*, about 10 cm below the navel as the center of origin of motion. These are in fact similar ways of talking about the nature of effort, of virtual body images, and of harmonious movement.

Effortlessness of Paradoxical Rebound

A special and useful means of effortless movement is provided by a very remarkable feature of the neuromuscular system which provides a quasi-elastic "*rebound*", and provides this even without an initial movement in the opposite direction, with *merely its thought*.

To explain what is meant by this, consider first the movements of a conductor, for example. Let us consider the down and up movement of the arm, giving a beat. The up movement however occurs *effortlessly*, like a rebound of the down movement. If one were to raise the arm a similar height starting from rest, it would surprisingly involve *more* effort, instead of less. Moving first downward, it requires twice the acceleration to reverse and move up - yet it rises effortlessly, *as if* there was an elastic rebound in the muscles. Physiologists in fact tried to explain some of this by elastic properties of the muscle-ligament system, citing the bounding of the kangaroo as an example of such elastic energy conservation. However this explanation is readily shown to be inadequate, since it is possible to achieve the same effortlessness of lifting by merely *imagining* the initial downward movement! Try raising your arm from the stationary position, but imagine it to move first down for a fraction of a second. It will seem much easier, the sense of effort reduced. The same can be tested with heavier weights and objects. Interestingly, this property, which would be surprising to physiologists, is well known among Feldenkrais practitioners, whom I saw demonstrate (and participated in such a demonstration) that three people can lift another person, who is standing up, much more easily, if they first just *think* to push him down, *without* actually pushing down.

This paradoxical property, an instance where effort is modified by action of the nervous system, is neurophysiologically still not understood. It can be effectively and extensively used for effortlessness in playing musical instruments. Specific details of this have to be left for another suitable occasion.

When to suggest effort effortlessly

The sense of effortlessness is central in advanced performing; it should appear effortless and be effortless. Chopin often admonished that the fingers should not strike the keys, but should *fall* on the keys. The sense of "falling" gives a totally different feel to the action of playing, one that leads to smoothness and effortlessness. However in playing Beethoven, for example, an impression of glib effortlessness is out of place: the effortlessness must sometimes itself suggest effort, in accordance with the requirements of the meaning of the music, since there is an "ethical restraint" in the Beethoven pulse, a massiveness, which is essential. If that disappears the music correspondingly loses substance. The ultimate task is to combine passion with effortlessness - only a seeming contra-

diction. When required, one needs be able to suggest effort effortlessly! Casals for example at times did this with a deliberately 'scratchy' or 'throaty' tone at the onset of certain notes, especially in the bass register (at other times intensity involuntarily surfaced through a grunt!).

Passion, and the Passion to be Aware

Both Feldenkrais and Alexander methods are good ways to unlearn the prison of old habitual ways of moving, and are steps towards this freedom. In achieving this, we must often get rid of accumulated remnants of virtual body images of past, repressed emotional experiences; postures, tensions, and uses of the body that have become habitual and unaware, frequently of emotional origin.

But these methods by themselves do not tell you how to use this freedom to make living music, to find the inward musical thought which guides ever more finely to the true and beautiful in music, to the profound rather than the trivial. This requires freedom but such freedom is not enough. Needed further is the inner passion, issuing from a core of peace, which can become clearly manifest through the body when there is freedom. The passion in the true sense of the word is the "Ursprung", or better the "Ur-Sprung", the source, of music. We are using the word passion here not in the commonly used sense, but as the passion for the true, for the beautiful and the good, passion in the sense Krishnamurti or Casals used and exemplified the concept. The passion for the holy, as is imbued in Bach, or for love, reverence, joy, in the great composers, the compassion with which it views sorrow, the great romantic passion in music that portrays such. What is such passion, waiting to be released? Passion affects and lights the body, it is an enthusiasm, a fire, an enormous energy. It is released by the pure shapes of expression. It is the ultimate source of why we should bother with the infinite refinements of musical shaping. What does it matter whether we shape a phrase with a pure love shape, or pure sorrow shape, or a pure joy shape? In the end it is all the same, so say the cynics, and the depressed. Passion¹ gives a lie to all this. Such passion includes as a cognitive substrate the conviction that life is worth living; more than that, that it is wonderful, that it is a gift from heaven, a holy

¹ This use of the term exceeds the conceptual confines of sexual passion and libido (a word which derives from 'play') and because of its substrates cannot simply be treated as sublimated libido.

thing itself. That with all the difficulties of life there is a clear light², a light which music can tap, a light which shines when music is played with full life in its tones, that can make the joy in music, in its ultimate shape, be better even than joy itself.

There is mutual interaction between purely expressed essentic form, passion, and inner freedom. This mind-body interplay is a field that needs much more exploration. Sentic cycles, a discipline of expressing a series of emotions by touch in an ordered way, a simple art form of touch, goes a modest way towards exploring aspects of this. Through the expression of essentic forms in a seated position, the body becomes very quiet and very free. The doors are then open for passion, in the best sense of the word, to flow³.

Not with the energy driven by anger and hostility, but with what feels like a 'life force' (Lebenskraft); it is not the passion to fight, but the passion to create, to breathe, to feel, to comprehend. Passion to be wholly aware.

Such passion affects the body: watching Toscanini conduct, his ears became progressively bright red as the performance progressed, even in his eighties, except for the last two performances. Casals, in his nineties, moved like a man in his forties when he sat on the conductor's seat. Music lives on the present: it amplifies the present. It is a way to step outside one's own lifeline, and celebrate the present, which after all is all that exists. In that present imbued with music, the past and the future are played with in music's own time frame - one is lifted out of the personal chain of time to a free world, in which meaning and body intimately coalesce; the impulse to move, the inner gesture are so much part of music that without them, music is literally unthinkable.

In the best of music, those movements are increasingly inward. In the last quartets of Beethoven, even the pulse ceases to attract the feet: in an Apollonian breakthrough, the pulse is felt inside, as universal energy, channelling not to the feet, but to the 'heart': what that means in body and neurophysiologic terms remains to be explored. When known, it will be further seminal to a comprehensive understanding of mind-body interaction, music and health.

² metaphor for grounding of the psyche, another metaphor: after all can we ever get beyond metaphor? Goethe's words: „Alles vergaengliche ist nur ein Gleichnis“ come to mind, but: essentic forms are not vergaenglich - they are, in a real sense, unvergaenglich!

³ Casals often talked about "freedom with order", "fantasy with order" as guiding principles, in music and otherwise. He did not live to see their unforeseen and unprecedented political eruption and testing we are so gratefully witnessing today.

We are indeed now the first living beings who can understand the plan of their own existence, their DNA, and to know further that this plan is not merely a 'blueprint' for our construction, but an intricate dynamic system so that thought can exert influence at the gene regulation level to promote or to inhibit specific gene products, throughout life. We may then come to look at the mind-body windows of such music, as well as sentic cycles, as a way for directing thought to help our bodies to be in harmony with roots, mirrored in our cells and in our reaching up, roots of existence they may not otherwise as effectively tap: promoters, accessories for choosing our further, conscious evolution.

References

- Aggleton, J.P., & M. Mishkin (1986): The amygdala; sensory gateway to the emotions. In R. Plutchik and H. Kellerman, eds. *Emotion, Theory, Research and Experience*. Vol 3. New York, Academic Press
- Behne, K.E. (1982): Musik - Kommunikation oder Geste, *Musikpädagogische Forschung*, Bd. 3, 125-143, Laaber, Laaber Verlag
- Borchgreving, H.M. (1982): Prosody and musical rhythm are controlled by the speech hemisphere. In M. Clynes, (Ed.) *Music, Mind and Brain, the Neuropsychology of Music*, (pp. 151-157). New York: Plenum
- Clynes, M. (1969): Precision of essentic form in living communication. In K.N. Leibovic & J.C. Eccles (Eds.), *Information processing in the nervous system* (pp. 177-206), New York: Springer
- Clynes, M. (1973): Sentic: biocybernetics of emotion communication, *Annals of the New York Academy of Sciences*, 220, 3, 55-131
- Clynes, M. (1975): Communication and generation of emotion through essentic form. *Karolinska Institute Symposium on 'Parameters of Emotion': Emotions' - Their Parameters and Measurement*, Lennart Levi ed., 561-601. New York: Raven Press
- Clynes, M. (1977): *Sentic, the touch of emotion*. New York: Doubleday Anchor. (New edition: 1989, Prism Press, London, New York, Sydney)
- Clynes, M. (1980): The communication of emotion: theory of sentics. In Plutchik, R., & Kellerman, H. (Eds.), *Theories of Emotion Vol. 1*, (pp. 171-216), New York: Academic Press.

- Clynes, M. (1983): Expressive microstructure linked to living qualities. In: J. Sundberg (Ed.), *Publications of the Royal Swedish Academy of Music*, No. 39 (pp. 76-181)
- Clynes, M. (1985): Music beyond the score, *Communication and Cognition*, 19, 2, 69-194
- Clynes, M. (1986): Generative principles of musical thought: Integration of microstructure with structure, *Communication and Cognition*, CCAI, Vol. 3, 185-223
- Clynes, M. (1987): What a musician can learn about music performance from newly discovered microstructure principles, P.M. and P.A.M. In: A. Gabrielsson (Ed.), *Action and Perception of Music* (pp. 201-233), *Publications of the Royal Swedish Academy of Music*, No. 55, Stockholm
- Clynes, M. (1988): Generalised emotion, how it is produced and sentic cycle therapy. In M. Clynes & J. Panksepp (Eds.), *Emotions and Psychopathology* (pp. 107-170), New York: Plenum Press
- Clynes, M.: Guidelines to Sentographic Methodology and Experimentation (in press, *Perceptual and Motor Skills*)
- Clynes, M. (1989a): Methodology in sentographic measurement of motor expression of emotion: two-dimensional freedom of gesture essential. *Perceptual and Motor Skills*, 68, 779-783
- Clynes, M. (1989b): Evaluation of sentic theory nullified by misunderstood theory and inferior sound: a reply to Nettelback et al., *Australian Journal of Psychology*. 41, 3, 327-337
- Clynes, M., Jurisevic, S., & Rynn, M. (1990): Inherent cognitive substrates of specific emotions: love is blocked by lying but not anger. *Perceptual and Motor Skills*, 70, 195-206
- Clynes, M.: Some guidelines for the synthesis and testing of pulse microstructure in relation to musical meaning. *Music Perception*, in press, vol. 8, 3, 1990
- Clynes, M., & Nettheim, N. (1982): The living quality of music, neurobiologic patterns of communicating feeling. In M. Clynes (Ed.), *Music, Mind and Brain: the Neuropsychology of Music* (pp. 47-82), New York: Plenum
- Clynes, M., & Walker, J. (1982): Neurobiologic functions of rhythm, time and pulse in music. In M. Clynes (Ed.), *Music, Mind And Brain: the Neuropsychology of Music* (pp. 171-216), New York: Plenum
- Clynes, M., & Walker, J. (1986): Music as time's measure, *Music Perception*, 4, 1, 85-120

- Cunningham, J.G. (1988): Developmental change in the understanding of affective meaning in music, *Motivation and Emotion*, 12, 4, 399-413
- Davidson, R.J. (1983): Affect, repression and cerebral asymmetry. In: I. Temoshok, C. Van Dyke, and L.S. Zegans, eds. *Emotions in Health and Illness*, New York Grune and Stratton
- Ekman, P. (1984): Expression and the nature of emotion. In: K.R. Scherer and P. Ekman, eds., *Approaches to Emotion*, Hillsdale, New Jersey, Erlbaum Associates
- Ekman, P., Levensen, R.W. and Friesen, W.V. (1983): Automatic nervous activity distinguishes between emotions, *Science*, 221, 1208-1210
- French, A.P., Russell, P.L. & Tupin, J.P. (1972): Subjective changes with the sentic cycles of Clynes. *Diseases in the Nervous System*, 33, 598-602
- Gabrielsson, A. (1986): Rhythm in Music. In: J. Evans & M. Clynes (Eds.), *Rhythm in Psychologic, Linguistic and Musical Processes* (pp. 131-167), Springfield, Ill.: Charles C. Thomas
- Gabrielsson, A. (1989): Intense Experiences of Music. First International Congress of Music Perception and Cognition, Kyoto
- Gillikan, S.G., & Bower, G.H. (1984): Cognitive consequences of emotional arousal. In: C. Izard, J. Kagan and R.B. Zajonc, eds., *Emotions, Cognition and Behaviour*, New York, Cambridge, University Press
- Hama, H. & Tsuda, K. (1989): Analysis of emotions evoked by schematic faces measured with Clynes' sentograph, IV. Congress of International Society for Emotion Research, March 1989, Paris
- Hama, H. & Tsuda, K. (1990): Finger-pressure waveforms measured on Clynes sentograph distinguish among emotions. *Perceptual and Motor Skills*, 70, 371-376
- Izard, C.E. (1984): Emotion-cognition relationships and human development. In C.E. Izard, J. Kagan and R. Zajonc, eds. *Emotion, Cognition and Behaviour*, Cambridge University Press
- Melnechuk, T. (1988): Emotions, brain, immunity and health. In: M. Clynes and J. Panksepp, eds. *Emotions and Psychopathology*, pp. 182-247
- Panksepp, J. (1982): Towards a general psychobiological theory of emotions. *Behav. Brain Sci.*, 5, 407-470
- Panksepp, J., Silvy, S., and Normansell, L. (1985): Brain opioids and social emotions. In: the *Psychobiology of Attachment and Separation*, M. Reite & T. Fields, eds. New York: Academic Press

- Panksepp, J. (1988a): The neurobiology of emotions. In: H. Wagner & T. Manstead (Eds.), *Handbook of Psychophysiology*, London: Wiley
- Panksepp, J. (1988b): Brain Emotional Circuits and Psychopathologies. In: M. Clynes & J. Panksepp (Eds.), *Emotions and Psychopathology* (pp. 37-76), New York: Plenum Press
- Pert, C.B., Ruff, M.R., Weber, R.J. and Herkenham, M., 1984, Neuropeptides and their receptors, *J. Immun.*, 135, 820s-826s
- Ploog, D. (1981): Neurobiology of primate audio-visual behaviours, *Brain Rs. Rev.*, 3, 35-61
- Plutchik, R. (1984): Emotions: A general psychoevolutionary theory. In: K.R. Scherer and P. Keman (eds.) *Approaches to emotion*, Hillsdale, New Jersey, Lawrence Erlbaum Associates
- Plutchik, R. (1988): The nature of emotions: clinical implications. In: *Emotions and Psychopathology*, M. Clynes and J. Panksepp (eds.) New York, Plenum Press, pp. 1-20
- Repp, B.H. (1989): Expressive microstructure in music: Preliminary perceptual assessment of four composer's "pulses", *Music Perception*, 6, 3, 243-274
- Stein, M. (1985): Bereavement, depression, stress and immunity. In: *Neural Modulation of Immunity*, R.G. Guillemin, M. Cohen, T. Melnechuk, eds., New York, Raven Press, pp. 29-44
- Thompson, W.F. (1989): Composer-specific aspects of musical performance: an evaluation of Clynes' theory of pulse for performances of Mozart and Beethoven. *Music Perception*, 7, 1, 15-42

Sentic Cycle Kits, consisting of a finger rest, instruction booklet and tape are available (for L 17.50) from the European Sentic Association, c/o Prism Press, 2 South Street, Bridport, Dorset, DT 6 3NQ, England

Prof. Dr. Manfred Clynes
 Queen's College, University of Melbourne
 Parkville, 3052 Australia