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The Abhidhamma Model of Consciousness AM₀ and some of its Consequences

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Abstract

An important compilation of canonical Theravada¹ Buddhist texts consists of the Abhidhamma collection, one of three sets of volumes known collectively as the *Tipitaka*². The texts in Pali, an ancient language related to Sanskrit, are compiled in the approximate period 500 BC to 250 BC. They cover about 5000 pages and deal with phenomenological psychology, obtained as side effect of meditation used as trained introspection. The Abhidhamma describes in a cryptic way an intricate model of consciousness on three levels. The first level consists of a discrete, serial stream of ‘atoms of awareness’ called *cetas*. Secondly, a linear sequence of *cetas* may form a ‘molecule’, called *vīthi*, being a cognitive-emotional conscious unit. Finally, each *ceta* has a substructure of conscious mental factors (‘elementary particles’), called *cetasikas*, acting in parallel. An important part of the Abhidhamma is the *Paṭṭhana*, covering about 2600 pages, that describes the mechanism of conditioning by ‘*kamma*’ between these *cetasikas* and *cetas*. A short sketch of the Abhidhamma model will be given. This is done by giving an interpretation of the theory, thereby reflecting the author’s present understanding and non-understanding. Through the model a natural interpretation will be given of notions like ‘neurosis’, ‘psychosis’ and also various coping mechanisms. Thereafter the model is used to describe the process of mental purification by the practice of mindfulness towards insight. The effects of mindfulness in psychotherapy fit in this explanation. Finally some methodological considerations and views on the compatibility of the Abhidhamma with neurophysiology are discussed.

Acknowledgments. This paper is based on inspiring lectures of venerable Sayadaw U. Nandamālabhivaṃsa (Mahasubodhayon, Sagaing Hills, Myanmar)

¹‘*Theravada*’ stands for ‘the teaching of the elder’ and is the oldest form of Buddhism that is still practiced, notably in Myanmar, Sri Lanka, Thailand and other South East Asian countries. The practice of *vipassanā* (insight) meditation, developing concentrated mindfulness, comes from this tradition

²‘Three baskets’; the other two sets are the *Vinaya*, dealing with rules for monks, and the *Suttas*, presenting long and short sermons of Buddha.

as well as on the books Bodhi [2000] and Nyanaponika Thera [1998]. It could not have been written without experience with intensive vipassanā meditation under the skillful guidance of the most venerable Phra Mettavihari (Buddhavihara, Amsterdam, The Netherlands). I thank Henk Blezer, Fabio Giommi, Suzanne Hermans-van Strien, Onno Meijer and Adeline van Waning for useful discussions.

1. The Abhidhamma Model of Consciousness

The Abhidhamma, sometimes rendered as ‘deeper teaching’, but also as ‘analytical insights regarding phenomena of existential importance’, deals with consciousness in an analytic and synthetic way. A classification is made of the *types* of consciousness and of the various *objects*³ it is directed to. For example the sight of a woman or the memory of the sound of a frog jumping in water is such an object. Examples of types of consciousness are perceiving these two objects with calm joy or with restless desire. The topic of investigation is phenomenological: this means that it is about consciousness as it appears, like (perceived) sight, sound and memory, and not about women, frogs or water.

During the course of the last two millennia several commentaries and sub-commentaries⁴ have been written on the Abhidhamma. Good modern commentaries are Nyanaponika Thera [1998] (an introduction) and Bodhi [2000] (a summary). Next to this there is an oral tradition, notably flourishing in Myanmar, explaining the field. Not all volumes of the original Abhidhamma are translated in English (five volumes of the *Paṭṭhana* are missing). Parts of those volumes that have been translated are considered by U Ñāṇamālabhivamsa to be based on a poor understanding of the subject and therefore not perfectly suitable for a study. This shows the importance of the study of Pali and the oral tradition.

Because of the complex nature of the topic, the text is rather technical, comparable to what is in science the periodic system of elements, tables of compound materials and their melting and evaporating temperatures. At the same time issues as compassion, shared joy and other ethical values are deeply interwoven in the theory. This paper is intended as a scientific interpretation of the Abhidhamma, version AM₀.

1.1. *Nāma-Rūpa*: mind and ‘body’

The Abhidhamma states that consciousness performs a task of ‘selfless’ data processing (there is action without an actor) and speaks mainly about ‘conscious cognition’, the dynamics of input and output. The Abhidhamma is not solving the body-mind problem, not even addressing it, but speaks from the conscious phenomenological side. On the other hand the ‘qualia’ of consciousness are addressed in an axiomatic fashion. One speaks about *pure consciousness* and *nibbāna* (‘nirwana’ in Sanskrit and English). These two concepts are

³In Dennett [1991] one is warned that the notion ‘object of consciousness’ leads to dualism. In the Abhidhamma this is not the case, as there is no subject, no self, see below.

⁴I.e. commentaries on commentaries.

not analyzed any further, but play a definite role. Later Mahayana⁵ Buddhists, outside the tradition of the Abhidhamma, have equated pure consciousness and *nibbāna*. This will be discussed below.

The input data, the *objects* of consciousness, come partly from the physical senses: sight, sound, smell, taste and touch. This type of input is called *rūpa*, often translated as body or matter⁶. Other input to consciousness comes from consciousness itself, outside the part coming from the physical senses⁷. Hence consciousness is also busy with itself next to *rūpa*. Consciousness as input is called *nāma*, often translated as mind, see Fig. 1. Below we will see that consciousness with *rūpa* as object, is immediately ‘copied’ to consciousness with a corresponding *nāma* as input.

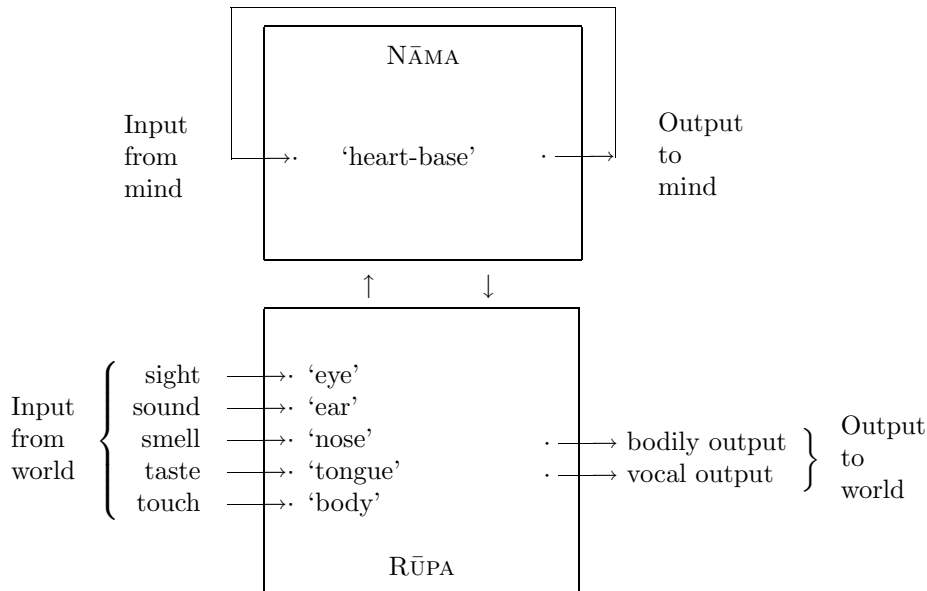


Figure 1: Nāma-Rūpa

The five physical senses and their physical organs are displayed explicitly. ‘Eye’, ‘ear’, ‘nose’, ‘tongue’ and ‘body’, stand for what is called ‘the sensitive (part of the) eye, of the ear, nose, tongue and body’. In the Abhidhamma also the mind is considered as a sense. The physical organ corresponding to mind is called the ‘heart base’, as the tradition was unfamiliar with the brain. Since one can observe relatively easily that emotions have an effect on the heartbeat, one can understand this choice.

It is emphasized that part of *rūpa* does not come from the physical senses, but from mind. Examples are the ‘mental glue’ that puts clouds of colors together to form ‘visible objects’. Also there are immediate judgments that some of these visible objects are edible or not or that they possess sexual quality. This is an understandable faculty of the human nature, as eating and mating

⁵‘Mahayana’ stands for the ‘large vehicle’. This form of Buddhism developed in India and remained until the present in China, Korea, Japan and some other countries. The emphasis is not on becoming enlightened but on starting the process of purification so that equipped with extra possibilities one may care for the world. Theravada Buddhism is often called *Hinayana* (small vehicle) by the Mahayana Buddhists, with an intended pejorative taste.

⁶The intended meaning is *perceived* matter, not the thing in itself.

⁷Memory is important for this.

are important survival factors. These parts of mental input are also classified as *rūpa*.

On the other side of the data processing by consciousness there is output. Next to the already mentioned output towards consciousness itself, the output also consists of initiation of body movements and speech. How this output is determined depends on what is called ‘causes and conditions’.

Next to *rūpa* as object for *nāma* and *nāma* as object for *nāma* there are two other kinds of mental objects: concepts and *nibbāna*, to be discussed later.

1.2. *Cetas*: mental ‘atoms’

The main thesis in the Abhidhamma model is that consciousness is not continuous, but comes in discrete packages of consciousness flashes. Each such flash is called a *ceta*. A *ceta* has the three phases⁸ of arising, existing and disappearing. The duration of a *ceta* is short. What we call thoughts consists of streams of many *cetas*, discussed later.

The main task of a *ceta* is to be concerned with some object. A *ceta* is said to be directed towards it. What a *ceta* does further, is to contribute to the determination of future *cetas*. We call this the kammic effect of the *ceta*. How this is done depends partly on the object captured by the present *ceta*. But there are also different *types*⁹ of *cetas*. For example, a certain visual object can be the data of a *ceta* with desire and attachment, with disgust and hatred or with loving kindness and compassion. Both the type and the object of the future *cetas* depend on those of the past ones. This leads to *accumulated kamma*, transferred and augmented from *ceta* to *ceta*. This kamma, in Sanskrit and English called *karma*, may activate something in the next *ceta*, or in a near or distant future *ceta*. The kamma is determined by the trace of the types of past *cetas*. It has the objects of the present *ceta* as side condition. Some types of *ceta* may have a direct effect on the following *cetas* (producing kamma), some have to collaborate with others (supporting kamma). Also the kamma force of some *cetas* can work against the effect of other *cetas* (obstructing kamma), and it is even possible that the potential action of a *ceta* is forever prevented by a later one (destructive kamma).

The Abhidhamma distinguishes 89 types of *cetas*. These types are divided into two major subgroups: those *ceta* types with strong kamma that has a direct effect without the need of supporting kamma, and those with only indirect (supporting) effect. The *ceta* types with producing kamma can be subdivided into unwholesome and wholesome. Unwholesome *cetas* lead to attachment and increased suffering. Wholesome *cetas* lead to freedom and decreased suffering.

Perpendicular to this there is a subdivision in spheres. There are the sensual (*kāmā*), sublime (*mahaggatta*) and supramundane (*lokuttara*) spheres of consciousness. The sensual sphere consists of those *ceta* types directed to pleasant feeling coming from the physical senses, e.g. caused by input from good food, beautiful sights or erotic pleasures. The expression ‘being directed to’ means

⁸These phases are not described in the Abhidhamma itself, but only in the commentaries, e.g. in Anuruddha [ca. 1150].

⁹In computer science terminology one would call these *states* of the data processing system.

that a sensual *ceta* causes behavioral action that tries to prolong or repeat these pleasures. *Cetas* in the sublime sphere are directed to mental pleasures like mystical states. In these there is a high mental concentration, often accompanied by bliss and rapture. It is emphasized in the practice of vipassanā (insight) meditation stemming from the same tradition as the Abhidhamma that mystical consciousness may be pleasant, but does not lead to purification or greater freedom. One needs the supramundane¹⁰ types of *cetas* for this purification. These are directed to *nibbāna* or pure consciousness. See Bodhi [2000] for a more detailed description of the 89 types of consciousness.

Sphere	Kind	Direct effect		Indirect effect	#
		Unwholesome	Wholesome		
Sensual		12	8	34	54
Sublime			9	18	27
Supramundane			4	4	8
#		12	21	56	89

Figure 2: Classes of types of consciousness (*cetas*) and the number of their elements¹¹

Here are examples of the 7 displayed classes of *ceta* types. Unwholesome are *cetas* based on greed, hatred or ignorance. For instance three of these twelve *cetas* are the following. 1. Greed combined with pleasure and wrong view (occurring when one eagerly wants to steal a desired object, without any insight that this is wrong). 2. Hatred with indifference without wrong view (this is when one wants to kill someone, knowing it is wrong, not in a rage but based on cold considerations). 3. Ignorance with restlessness (occurring for example after being criticized, desperately trying to defend one’s position with little success, without realizing it.). Wholesome *cetas* have mindfulness and thereby non-greed and non-hatred as a base. For example a *ceta* with pleasure and knowledge is in this subclass of 8 sensual ones. Of the class with 34 *ceta* types 15 types are concerned with physical input, some as a result of unwholesome or wholesome *cetas*. In daily life only 45 *cetas* play a role, a subset of those in the sensual sphere (the other 9 are only for Arahats, fully enlightened persons that no longer use unwholesome *cetas*). Among the 9 sublime wholesome *ceta* types one distinguishes the initiation of various kinds of mystical states (*jhānas*). The other 18 *cetas* in the sublime sphere are the blissful effects of these states (9 for Arahats and 9 for others).

The 4 wholesome supramundane *cetas*, are called *maggaceta* (path consciousness) and have *nibbāna* as object. One can have these *cetas* only once during one’s existence. These 4 occur as transition from the worldly state to the supramundane state (enlightenment, purified mind). They have a strong kammic effect. The consequence of their occurrence is that some of the unwholesome consciousness types will no longer be available. These 4 types of *cetas* are

¹⁰But not supranatural. Supramundane means that it is relatively rare for humans to have these *cetas*.

¹¹This table is inspired by similar tables due to Ven. Silananda in Bodhi [2000].

immediately followed by a corresponding *ceta* among the 4 types listed under ‘indirect effect’, also having *nibbāna* as object. These may occur several times, even for a long period. After the occurrence of the 4 *maggacetas* one is an Arahant, who does no longer have any *cetas* with productive kamma, but still can be affected by kamma from old such *cetas*. The sensual and sublime *cetas* together are called the ‘mundane’ *cetas*.

1.3. *Cetasikas*: mental factors

The *cetas* may be compared to atoms of consciousness that, unlike the material atoms, do not occur in space but in time. Each mundane *ceta* may be considered as being composed of mental ‘elementary particles’, the *cetasikas*. Literary ‘*cetasika*’ means ‘born together with a *ceta*’ and they are officially not part of the *ceta*. But as the term ‘*ceta*’ is most frequently used for the combination of *ceta* with associated *cetasikas*, a *pars pro toto*, one can consider the *cetasikas* as part of the associated ‘extended’ *ceta*¹², see Fig. 3. Not only the *cetasikas* appear simultaneous with their *ceta*, they also have the same object.

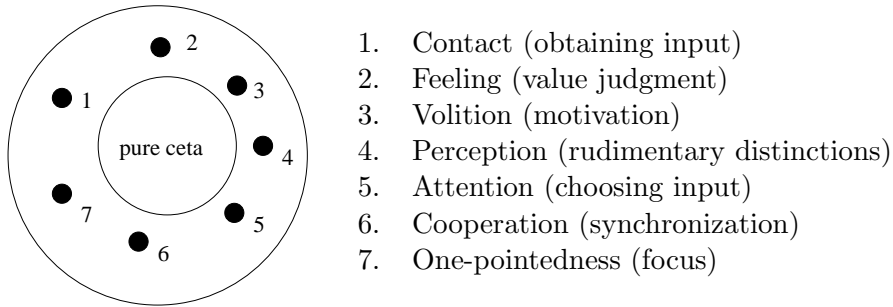


Figure 3: The minimal (extended) *ceta* consisting of pure *ceta* with the universal neutral *cetasikas*.

The *cetasikas* may be compared to coloring the otherwise clear pure *ceta*. Most *ceta* types are determined by their *cetasikas*. There are three main groups of *cetasikas*: unwholesome, neutral and beautiful¹³ ones. Perpendicular to this there is another main division: universal and occasional, see Fig. 4.

Below are examples of *cetasikas* for each of the 6 resulting classes. Also an important feature of the way the *cetasikas* do associate will be explained. The 7 universal neutral *cetasikas* are present in all mundane *cetas*. Typical ones are ‘contact’ (input), ‘feeling’ (a value judgment, being either pleasant, unpleasant or neutral) and ‘volition’ (being the driving force of kamma). The class of 6 occasional neutral *cetasikas* contain for example ‘energy’, ‘concentration’ and ‘bliss’. They may be added to the previous 7 and if nothing more is added one obtains factors necessary for the already mentioned mystical states.

¹²The isolated *ceta*, not the total of *ceta* and *cetasikas*, is called *pure consciousness*.

¹³The beautiful *cetasikas* are not called ‘wholesome’ as they have too little kammic force to be wholesome. Only in combination with some other *cetasikas*, related to energy and concentration, wholesome *cetas* are formed.

	unwholesome	neutral	beautiful	#
universal	4	7	19	30
occasional	10	6	6	22
#	14	13	25	52

Figure 4: Classes of mental factors (*cetasikas*) and the number of their elements.

Next to the 7 universal neutral states one may (going over to the left in Fig. 4) include the 4 universal unwholesome *cetasikas*. These include ignorance and restlessness. Making consciousness worse, one may go over downwards and add some of the occasional unwholesome mental factors, like greed or hatred. The Abhidhamma states that these two cannot occur together, so there are several possibilities, resulting in the 12 unwholesome *cetas*. Having a *ceta* with as factors ignorance and hatred, things really become dangerous if one adds to the mixture concentration and energy, from the occasional neutral group. Equally dangerous and perhaps more explosive is the combination of ignorance, greed, energy and bliss. The reason is that as soon as consciousness cannot obtain what it wants (object of the greed), then it may suddenly flip to hatred and react in unexpected ways.

Let us go over to the right, towards universal beautiful *cetasikas*. The main mental factor here is ‘mindfulness’. It freezes the kammic effects of consciousness by reflecting on it, by going to another level. For this reason mindfulness is called meta-awareness in Teasdale [1999]. See Nyanaponika Thera [1986], Tich Nhat Hanh [1976] and Barendregt [2005] for descriptions of the power of mindfulness (the latter in terms the foundations of mathematics and computer science). The power of mindfulness is so strong that 18 other factors arise automatically, including non-hatred, non-greed and malleability of body and mind. Then one may go down in the table and add items from the list of occasional beautiful *cetasikas*, like ‘compassion’ (staying close to another if that person suffers) and ‘shared joy’ (enjoying without jealousy the joy of others). The combination of the occasional neutral *cetasikas* with the beautiful ones gives a particularly effective wholesome kamma. As will be explained below there is an important difference whether this is done together with all the 25 universal and occasional beautiful *cetasikas* or only with a subclass of these (that must contain at least the 19 universal ones).

1.4. *Vīthi*: cognitive-emotional processing

Now we come to the ‘molecular’ level of consciousness, consisting in a serial collaboration of *cetas*. The entering of physical input (*rūpa*) is modeled in the Abhidhamma as a sequence of 17 *cetas*, forming a so called *vīthi*, a *ceta street*. Most *cetas* in a *vīthi* have the same object. The first 8 *cetas* in a *vīthi* serve to start the process and to receive input. Then follow 7 *cetas* (so-called *javanas*) of the same type containing strong kamma. Finally two *cetas* are used to terminate the *vīthi*. Such a cognitive-emotional unit is placed in what may be called *baseline* consciousness (*bhavaṅga*). This is a series of *cetas* of the same type and having the same object that for each individual remains

constant during life. In particular one's birth and death consciousness (*cetas*) have the same type and object as the ones in baseline consciousness. Although there is no productive or destructive kamma in the baseline, its supporting or obstructing kamma has a strong influence on one's life. The initial and final phase of a *vīthi* starts from and return to bhavaṅga. Next to *vīthis* based on *rūpa*, there are *vīthis* for *nāma*. These have a shorter length, namely 12. There is more 'work to do' going from baseline consciousness to physical input and back, then to mental input and back.

A *vīthi* for physical input is always followed by three *vīthis* for mental input, copying the object mentally and giving it a name and meaning. So the cognitive-emotional process consists of four *vīthis*, where each time one has to rise from and go back to baseline consciousness. In some sense this is a bit cumbersome. During mystical experiences, the so called *mental absorptions* or *jhānas*, the cognitive processing is different. In this consciousness process the *vīthis* may be prolonged indefinitely. There is no need for departing and going back to baseline consciousness¹⁴.

One of the *vīthis*, that can be reached through mental development, contains *maggaceta* (path consciousness) leading to enlightenment. The effect is that fewer *cetas* with strong unwholesome kamma are available for use as consciousness. Therefore less accumulation of kamma occurs. As stated before an Arahant is a fully enlightened person, in whom none of the *cetas* with strong kamma can be used any longer. For the wholesome *cetas* a 'clone' is available for them having the same effect, but no addition to the (in this case wholesome) accumulated kamma.

1.5. Classification of Objects

The meaning of the term 'object' in the Abhidhamma is different from that in daily life and science. Matter (*rūpa*) forms an object for consciousness. But as we saw, consciousness also can have (previous) consciousness (mind, *nāma*) as object. Next to *rūpa* and *nāma* there are exactly two other kind of objects: concepts and *nibbāna*. Concepts can be thought to emerge from the *vīthis*. One can compare the first two kinds of objects to a black letters on white paper¹⁵, while concepts correspond to the words printed by these letters. The cognitive-emotional process corresponds to forming a sentence. In this simile *nibbāna* may be compared to the white between the letters. This whiteness can be object of observation, try it while you read on.

¹⁴If in a computer two numbers are added, then first one has to undress the formal representation of the numbers to their bare essence, then to add these and then to pack the result again as the formal representation. In modern computers there is a procedure called *pipelining*, during which the intermediate results of an addition are no longer packed to the formal representation, but remain in their bare essence; this results in a high performance. This is similar to the described implementation of mystical experiences.

¹⁵I am still looking for an extension of this metaphor differentiating between *rūpa* and *nāma*. The mechanism of quoting seems attractive: "Maria is a nice girl, consisting of collaborating cells, while her name 'Maria' consists of five letters." But quoting is also used to explain the phenomenon of mindfulness, see Barendregt [2005], so I prefer another comparison.

	conditioned (<i>sankhata</i>)	unconditioned (<i>asankhata</i>)
absolute (<i>paramattha</i>)	matter, mind	<i>nibbāna</i>
conceptual (<i>paññatti</i>)	‘existing’ concepts, ‘non-existing’ concepts	mathematical concepts

Figure 5: Classification of objects

The elements of the class *rūpa* and *nāma* and also *nibbāna* are all called *absolute* objects (*paramattha*). Ideas are called *conceptual* objects (*paññatti*). The reason for this classification seems to be that *nāma*, *rūpa* and *nibbāna* fit in one *ceta*, while concepts need *vīthis* in order to be perceived¹⁶.

Next to the classification between absolute and conventional objects, there is the division between conditioned and unconditioned ones. Traditionally only *nibbāna* is considered as unconditioned object. Slightly extending the analysis in the Abhidhamma one can put mathematical ideas also among the unconditioned ones. In this way one obtains a classification as in Fig. 5. A concept like ‘dress’ is called conditioned, as it depends on fashion what kind of arrangements of cloth are thus called. Nevertheless, it is a concept that has reality value. A concept like ‘dragon’ is also conditioned, as it depends on the myths of a certain culture how such an animal is imagined. We know that there are no dragons. Therefore, one calls a dress an existing conceptual object and a dragon a non-existing one. A third class of ideas is unconditioned: mathematical concepts, like prime number¹⁷, do not depend on any conditions and are permanent. Therefore I like to extend the Abhidhamma classification by adding these concepts under ‘unconditioned’. *Nibbana* is an object that is both absolute and unconditioned.

One may wonder why one needs the concept of pure *ceta*, i.e. *ceta* as the awareness part of the *ceta* and *cetasikas* combination. The *cetas* have as task to direct themselves to objects, but the *cetasikas* are already doing this. So there seems to be no need for pure *ceta* to do this as well. Another role for pure *ceta* is to give consciousness its ‘qualia’ aspect. Now consciousness without *cetasikas*, i.e. the pure *ceta*, is said to have *nibbāna* as object. So this pure *ceta* has an active description, while *nibbāna* is passive. But in its passivity *nibbāna* becomes active, notably if it is seen in the metaphor of the white page on which the black letters come ‘to life’. Therefore it seems that one may eliminate one of the two primitive notions ‘pure *ceta*’ and ‘*nibbāna*’. This thought does not occur in Theravada Buddhism. But it has been stated by the Mahayana

¹⁶A concept can be the object of one *ceta*, but then it is stored as a code.

¹⁷A number $p > 1$ is called *prime* if it is only divisible by 1 and itself. E.g. 2, 3, 5, 7, 11 are prime numbers and 4, 6, 9, 12, 15 are not. Whether these mathematical concepts are real (existing) or imagined (non-existing) is a discussion in the philosophy of mathematics that we do not enter here. During the intensive study of mathematics, there is a shift in the mind of a student concerning the way mathematical objects are stored. First the notion ‘prime number’ is replaced by the shorter notion ‘prime’. Then primes are no longer perceived as concepts, but as ‘mind-objects’, having an emotional value that one may use in order to gain intuition. Thus primes move from unconditioned concepts to absolute mind-objects, that are conditioned as they form part of our mind, e.g. their emotional value depends on our knowledge of them.

philosopher Nagarjuna that ‘*nibbāna* is *samsara*¹⁸’, thereby equating it in fact with pure consciousness¹⁹. This is an attractive approach and fits with the use of Ockham’s razor.

Nibbāna plays an important role in the Abhidhamma model. If it is used as object of consciousness (*maggaceta*), then part of the unwholesome *cetas* are ‘rooted out’, i.e. forever removed. Why is this? The following may be the case. At first the discontinuity of consciousness (discreteness of the *cetas*) seems dangerous and frightening. It is related to egolessness, i.e. uncontrollability of what happens. Together these aspects of existence are metaphorically called ‘the void’ or ‘emptiness’. But a clear view on *nibbāna*, the essence of being aware, gives the insight that the void is not dangerous at all. This insight makes the kammic force (nausea) of the experience of emptiness disappear and thereby causes the purification of consciousness.

2. Psychological Consequences

In this section several phenomena, known in clinical psychology, will be interpreted on the basis of the Abhidhamma model. That several symptoms or syndromes can be described does not imply that there is an obvious way to treat them. Nevertheless, the modelling of the symptoms may lead to a theoretical explanation why some methods of mindfulness based therapy are successful. This will be discussed in the next section.

2.1. Neuroses

As stated before, all *cetas* contain the *cetasika* of feeling. In a *vīthi* this is enlarged by the 7 occurrences of javanas. On the other hand several *vīthis* together, as a long train of *cetas*, constitute the cognitive emotional process. The feeling present in the single *cetas* may prefer things different from the thoughts in the *vīthis*. In this way an inner conflict may result. This is an interpretation of Freud’s description of neuroses as the conflict between the super-ego, at the level of cognition, and the *id* that directs our drives. Freud made a good point when he noticed the unscrupulous power of the *id* doing things that morality does not allow. This is an example of producing kamma that cannot be avoided. The organization of consciousness, as described in the Abhidhamma model, shows that we have a basic neurotic core in our mind.

Some forms of psychotherapy are directed to address the cognitive level of our mind by trying to modify one’s thinking, i.e. one’s *vīthis*. One may learn that one should not desire some things that do not belong to us. But this does not help if there is inside us a *ceta* with strong *cetasika* that desires that very

¹⁸*Samsara* is the circle of birth and death, to be avoided.

¹⁹It is unknown what this pure consciousness is. In vipassanā retreats one is not allowed to think about it, as it can be very distracting. The opinions about this notion vary. Some authors propose to extend contemporary physics in order to accommodate pure consciousness (Chalmers [1996]); others claim it already fits within quantum physics (Stapp [1993], Schwartz and Begley [2002]); then there is the proposal to treat pure consciousness as a primitive term (Hut and Shepard [1996]); while others claim it is a superfluous concept (Dennett [1991]).

object. Working directly with the *cetas* and *cetasikas* may be a welcome and powerful addition to the mentioned forms of psychotherapy.

2.2. Psychoses

Later psychoanalysts, see e.g. Eigen [1986] and Suler [1993], speak about the basic *psychotic core* of the mind. This can be explained in a natural way from the Abhidhamma model. Falling apart from the apparent continuous consciousness to its true scattered form of *ceta*-based *vīthis* can be seen as the underlying mechanism. This also explains why psychotic episodes tend to reoccur. If one has seen things as they are, than that insight remains.

Psychosis can be linked to phenomena of dissociation. In a light and innocent form a dissociation occurs in children (and older humans as well) doing the ‘repeated word game’. Taking a word like ‘yellow’, they speak it out repeatedly. After a while they notice that the word loses its meaning. In psychology one speaks about a ‘semantic fatigue’ or a ‘*jamais vu*’. Usually there is a close connection between a word as sound and the meaning of a word. These two come in consecutive *vīthis*. After repeating the word many times, the sound function gets emphasized and may occur without an immediately following meaning, which may be absent for a short moment. The child has succeeded in separating the sound and the meaning that are both associated to a concept.

In stronger forms of dissociation cognitive formations may be not functioning as usual, by being temporarily dysfunctional or even being completely absent. From the Abhidhamma model this is quite understandable: cognition has to be formed by an active process and this may temporarily not be the case. For the common sense intuition the phenomenon may be quite startling. One loses grip, as the usual model of the world and of oneself slides away. As a reaction several mental alarms may start to ring. It is the presence of these alarms that makes the dissociation be felt as an extremely painful experience. Indeed, the alteration of perception of our body, our person or our world (desomatization, depersonalization, or derealization) may be utterly shocking. This ‘detachment’ often is accompanied by a powerful feeling of lack of control ‘compartmentalization’. These phenomena, emphasized in Holmes et al. [2005], could be seen as a malfunctioning of the two arrows between *rūpa* and *nāma*: detachment as deficit in the encoding arrow from *nāma* to *rūpa*, and compartmentalization as retrieval deficit in the opposite arrow, see Fig. 1.

During a neurosis the observer can feel that it is his or her view that is in conflict. During a psychosis it feels as if the actual world, our actual mind or our actual body is no longer there.

The presence of these powerful secondary reactions is one of the reasons that the phenomenon of psychosis is a serious one. The other reason is that the phenomenon is based on actual experience: that of the dancing *cetas* making up the *vīthis*. If it were the case that the underlying phenomenon were a rarity, like seeing a disgusting sight, then one would be able to overcome the traumatic experience more easily. But in case of the psychosis, based on the experience of an omnipresent actual internal phenomenon, more is needed to comfort the traumatized person.

On the other hand, the possibility of purification described in the Abhidhamma model seems to imply that one can be cured from reoccurring psychoses. This view on mental illnesses (often seen as incurable) has been stated in Podvoll [1991] and seems to be consistent with the view of Bleuler [1911]. In Menninger et al. [1963] it is even described that some schizophrenics get “weller than well”. This may also be related to the process of purification. The present author does not have a view on whether reoccurring psychoses may be cured, but likes to emphasize, on the basis of own experience with the purification path and of the Abhidhamma model, that it is worthwhile to investigate this possibility.

2.3. Cover-up of Emptiness

The experience of fragmented personality and cognition as a stream of cetās is known to meditators. According to the above discussion it may cause in a person (familiar or not to meditation) an acute psychosis. This ‘existentialist’ experience is so horrendous, that if one wrongly would see someone else as its cause, then one could kill that person. For this reason I called this experience the ‘very cause of war’, see Barendregt [1996], in order to emphasize its power. As is well-known Buddhism often speaks about suffering (*dukkha*). Here one may think of negative aspects of life, including transiency, as its cause. But, as explained in Buddhagosa [ca. 450/1999], the principal meaning of this Pali word comes from its two roots ‘*du*’ and ‘*kha*’. The first stands for ‘disgust’ and the second for ‘emptiness’. In this respect the existentialist ‘nausea’ related to ‘nothingness’, to be found in the work of Sartre, comes very close.

To the person experiencing the void, whether meditator or psychotic, it comes as a shock. In many cases some emergency mechanisms automatically start to work to avoid the emptiness. My father Johan T. Barendregt, during his life a professor of clinical psychology, specialized working with patients suffering from phobias. His clinical observation was that all these patients had previously experienced a form of depersonalization in which they became aware of an inner ‘chaos’ and experience of ‘being without control’. He coined the hypothesis that phobias are a way of repersonalization based on fear, avoiding the feeling of uncontrollability, see Barendregt [1982]. Indeed, the state of fear may be unpleasant, but gives a psychological hold. Therefore by the sufferer it is ‘preferred’ over the state of the void. But it should be emphasized that the person in question does not make a conscious choice. The phenomena just happen. In my own Barendregt [1996] this hypothesis about the role of fear is extended to other strong affects, like hatred and desire. This is based on experience reported in that paper and in Barendregt [1988]. Also depression may be seen as a cover-up of emptiness. The notion of cover-up also occurs in Podvoll [1991]. The emergency exit from emptiness does not need to be a ‘negative’ affect. For example falling in love is seen in Barendregt [1982] as a ‘pleasant’ form of avoiding the emptiness.

There is a third way of avoiding the emptiness: using drugs, either medically prescribed ones or street-drugs. In fact the pharmaceutical market for antipsychotics is 20 billion US\$ yearly. That of street-drugs is unknown, but it is claimed that the number of deaths from overdoses of prescribed drugs

exceeds that of street-drugs by far. Be that as it may, it is clear that the fragmentation of consciousness as a chain of *cetas* has far reaching consequences by the claimed nauseating feeling it causes. Another ‘neutral’ way to cover-up the *ceta* process may be the clinging to ideas. This can be seen as the deeper cause of religious wars. Finally the most elevated way to cover-up the void is by developing ‘mystical experiences’, the so-called states of ‘mental absorption’.

The three ways of cover-up can be seen as ‘hatred’, ‘greed’ and ‘ignorance’, the main symptoms of continued suffering. All forms of cover-up of the ‘void’ or ‘emptiness’ caused by the deterministically flowing stream of *cetas* are seen in Barendregt [1996] as a symptomatic medicine. They act as glue and makes consciousness apparently continuous. But it does not change the fundamental fact that we do not have an absolute control over our mental life. The ‘negative’ and ‘positive’ affects as well as the hiding by drugs and ignorance are all seen in the Abhidhamma model as unwholesome. The Pali word for ‘unwholesome’ is ‘*akusala*’ being the opposite of ‘*kusala*’, which literary means taking out (*sala*) the nausea (*ku*, being a synonym of *du*). The discrete essence of consciousness and its resulting counter-reactions can be seen as its main cause. From the *ceta* model it seems to follow that one either suffers from psychosis or is involved in a symptomatic cover-up. Cultivating the middle way using mindfulness provides a way out of either form of suffering. This and its therapeutic consequences will be discussed in the next section.

3. Development of Mindfulness and Compassion

The Abhidhamma model has been obtained as a side effect of completing the path of purification. Having the description of that model, the path itself can be stated in a relatively simple way. It should be emphasized that the path is a practical course, similar to learn how to sail on the ocean. Therefore the explanations below, not to be found in the Abhidhamma itself but in the Suttas, do miss something: the actual experience that cannot be conveyed in words²⁰.

3.1. Mental development

The goal of the path of purification is to prevent that unwholesome *cetas* are being used. In this way no new negative kamma is accumulated and one obtains a larger degree of freedom. Lower insects are programmed in such a way that they fly towards a source of light, including a dangerous candle. Higher insects can avoid this. The path of purification may be compared to the transformation from a lower to a higher insect.

In order to avoid unwholesome *cetas* one needs the intuitive insight that the apparent need to use them is unjustified. Our system seems to be based on the need for desire, hatred or ignorance in order to glue the fragmented *cetas* to a whole. But this is not the case. This fundamental insight, however, cannot be forced, it has to come ‘by itself’. But it can only develop if the mind is relatively calm, concentrated. Concentration cannot be forced either. It has to

²⁰This is not at all peculiar: learning to sail, to play the piano or whatever other interesting activity in life, cannot be learned from books alone.

be developed following a certain plan. It is like a plant that grows from a seed, provided that one gives it soil, water and light. This simile shows that on its turn concentration needs another mental factor: discipline. At first will power can be used to obtain discipline that is needed. Using this initial discipline one can build an initial degree of concentration. Then using this concentration a higher degree of discipline can be obtained. At the same time one's view of what has to be done can be sharpened. In this way one obtains the right conditions on which insight can grow.

3.2. Mindfulness

The main tool in this process of mental development is mindfulness. It is the capacity to be close to mental input, *cetas* and *cetasikas*, without being sucked away by them. For example one can be close to a desirable or fearful object, without losing control of what happens next. Mindfulness in its first approximation consists of naming what is happening. 'O, there is desire' or 'O, there is fear'. Later, one can improve mindfulness to *noting*. This is like naming, but without making use of natural language. Indeed, 'there is fear' is a weak and inaccurate substrate of the real fear. The right mindfulness (*samma sati*), is able to be present as *cetasika* in the *cetas* directly. The aim is to develop mindfulness in such a way that it addresses the *cetas* "one at the time, on time and all the time", as a good meditation teacher will instruct. In this way all the hidden corners of the mind can be reached and purified.

The first milestone to be reached is the purification of the 'course defilements' such as doubt, sleepiness, greed, hatred and restlessness. This can be accomplished by developing confidence, effort, mindfulness, concentration and analysis. It is important that these five faculties are developed in a balanced way.

3.3. The Three Characteristics

After that, sharper mindfulness will reveal to the meditator a clear vision of the the *ceta* process. One is able to observe the *three characteristics of existence*: chaos, nausea and uncontrollability. This is the meaning of the Pali terms *anicca*, *dukkha*, *anatta* that usually are rendered as impermanence, suffering and egolessness. It is the penetrative function of mindfulness that brings the meditator to this experience. The experience is overwhelming. The reason is that for the first time one observes the self-less phenomenon of consciousness. Because the meditator is not ready for this, he or she will go through phases of anxiety, disgust or depression. This state of mind can be compared to a psychotic dissociation with its known effects. In the context of the path of purification it is considered as a *disidentification*.

3.4. Purification

At this point the protective function of mindfulness needs to be developed. With proper effort this can be done relatively quickly, as the necessary prerequisites are already present. The meditator has to observe, that while continuing the

practice, there occur short moments of a calm mind. Podvoll [1991] calls the occurrence of these ‘islands of calm’, from which, if well developed, a calm and blissful state²¹ can be obtained.

Arrived at this stage in mental development, there is nothing more to do than to keep performing the act of mindfulness. At some point one considers making mindfulness as a burden. With the right intention and surrendering one may stop having to make mindfulness. If the meditation practice has grown to a mature level, then mindfulness may flow by itself and one obtains a purely observing stream of consciousness. If this happens, then the fundamental purifying insight that sets one free arises.

Purification happens in four consecutive stages. Each time the meditator is brought closer to full enlightenment. In the first stage, the meditator becomes a *stream-winner* who has eliminated the *cetasikas* of wrong view (of the existence of ego as a solid object) and doubt (needing to defend this ego). At the second stage of a *once-returner* the sharp force of greed and hatred is attenuated. At the third stage one has eliminated the use of greed and hatred and becomes a *non-returner*. At the last stage one becomes an *arahat*, having no more pride, restlessness, sleepiness, desire for mystical states or existence and ignorance.

The need for purification due to the flashing *cetas* before meaning is caused by ego’s existential need to be in charge. Perceiving that one is not causes fierce fear. The path of purification domesticates this fear. The existential fear may be compared to our feelings of dizziness and nausea while falling. These can be domesticated: an experienced parachutist or astronaut, also subject to the same lack of gravity, enjoys the wide view from above.

3.5. Modelling the Purification

Even if ordinary consciousness consists of the discrete *cetas*, it seems flowing continuously. One can imagine that the object of consciousness is determined by a gradient, i.e. a direction that metaphorically is an indication of the character of the object. Ordinary consciousness looks stylistically as follows.

$$\backslash\backslash\backslash\backslash\text{-----}////////| | | | \backslash\backslash\backslash\backslash\text{-----} ______//////// \quad (1)$$

This means that the object and type of the *cetas* do vary, but not too fast and in a smooth way.

Now imagine that the chaotic consciousness of the three characteristics starts for a moment as follows, including unwholesome kamma denoted by —. This is the phase in which one sees the three characteristics for the first time.

$$\backslash| \text{—} / - / \text{—} \text{—} _ \backslash \text{—} \text{—} \backslash \text{—} \backslash \text{—} \text{—} _ | | \text{—} \backslash \text{—} \text{—} | - // \text{—} \text{—} | \quad (2)$$

Then the movie gets saturated (‘covered-up’ in Barendregt [1996]) with strong feelings that reinforce themselves. This develops into an overwhelming kammic experience that causes strong mechanisms of fear, disgust or depression.

²¹Here state may be compared to the weather. It has a dynamic structure, but temporarily it has its own character.

$$\left. \begin{array}{l} \backslash _ _ | _ _ / _ _ - / _ _ _ _ _ _ _ _ / _ _ \backslash _ _ - _ _ - \\ _ _ \backslash _ _ \backslash _ _ _ _ _ _ _ _ _ _ _ _ / _ _ || _ _ - _ _ \backslash \end{array} \right\} \quad (3)$$

If one uses psychopharmacological or some other drugs one may obtain a similar but even more rigid state of mind.

$$\left. \begin{array}{l} \backslash _ _ | _ _ / _ _ - / _ _ _ _ _ _ _ _ / _ _ \backslash _ _ - _ _ - \\ _ _ \backslash _ _ \backslash _ _ _ _ _ _ _ _ _ _ _ _ / _ _ || _ _ - _ _ \backslash \end{array} \right\} \quad (4)$$

If, as alternative possibility, one continues to practice meditation, then it may happen that one obtains the ability to look with equanimity at consciousness described in (2) and (4). Then *maggaceta* removes the ‘poison of kamma’ from this type of consciousness:

$$\backslash | / - / _ _ - \backslash _ _ _ _ _ _ _ _ _ _ _ _ / || - \backslash \quad (5)$$

This is still chaotic but quite bearable, because the painful aspect is taken out. Pretty soon consciousness turns back to normal as in (1), by the natural tendency to concentrate. The natural order in which these types of consciousness streams occur is as follows: (1), (2) for a short while, (3) glued, (2) but now possible for a longer period, *maggaceta*, (5) and then (1). This is when one is lucky enough to be in the great monastic places, the laboratory of the mind. If one is not protected by the the right knowledge (*Dhamma*), but finds oneself in ignorant modern society, where panic gets replaced by drugs or compulsory behavior, then the sequence may be: (1), (2), (3), (4), (3), (4), During the practice one learns that it is better to first use mindfulness in order to *cope* with the situation. After that, insight can *cure* the mental state.

3.6. Ethics

The practice of mental development through mindfulness meditation has ethical value for an interesting reason. The claim is that what is fundamentally good for a person is good for everyone. The reason is that as long as there are still active *cetas* with greed or hatred, the person in which this is the case will encounter situations that cannot be manipulated and hence suffering arises. Only if these two types of *cetas* are eliminated, and those with ignorance as well, the practitioner becomes really free. Thus it happens to be the case that ethical behavior is a necessary condition for the obtainment of the mentioned purification. This has been emphasized in the so-called ‘noble eightfold path’ in which the right speech, action and livelihood are being emphasized. One behaves correctly, first out of duty and later, after purification, out of virtue.

3.7. Mahayana Buddhism: Compassion and Koans

In the Mahayana tradition it is not only mindfulness, but also compassion that is a principal *cetasika* that is being developed. As compassion is an occasional beautiful *cetasika*, this has the advantage that one develops mindfulness and all the other universal beautiful *cetasikas* as well. An important point is that in

presence of compassion *maggaceta*, leading to purification, cannot occur. This is because compassion has human beings as object, while *maggaceta* has *nibbāna* as object. This fits exactly with the Mahayana Bodhisattva vow of not wanting to become enlightened before all other beings are. Thus the Mahayana practice of compassion has a double goal of developing more beautiful *cetasikas* and postponing *maggaceta*.

Another particular aspect of Mahayana Buddhism, notably in the Rinzai Zen tradition, is the ‘koan’ practice. In this lineage the meditator is asked to work on a problem that does not have a logical solution. The purpose is to work hard on it so that the *vīthis* of rational thought get tired and stop working. In this way one may eventually enter the three characteristics of broken consciousness and obtain purification.

4. Methodology and Initial Evidence

We will discuss the methodology based on which the Abhidhamma model was constructed and speculate how it could fit within neurophysiology.

4.1. Methodology

One may wonder whether the Abhidhamma model has anything to do with reality, as it is obtained through meditative experience, which is a form of trained introspection. We claim it does.

The first argument is that mathematics, rightly considered as one of the most exact sciences, is also based on trained phenomenology. True, in this discipline results are based on calculations and proofs. But on its turn, one needs a mental judgment whether a calculation does apply and whether a proof is correct. Therefore mathematics, as emphasized by Husserl, Gödel, Bernays and others, can be seen as a phenomenological enterprise.

The second argument comes from the so-called Newton-Goethe dispute about colors. These two gentlemen did not live at the same time: they represent the position of the physicist and of the phenomenologist in a historic controversy about the nature of colors. Newton held that colors are a 1D (one dimensional) phenomenon. Indeed, light comes with a wavelength and different wavelengths correspond to different colors. Goethe on the other hand held that colors form a 3D phenomenon. He took a bag of 125 cubes each with a different color and wanted to order them in the ‘Montessori way’ (such that if their colors are similar, then they have to be placed near each other). Goethe could not do this putting the cubes in a linear array, nor in a plane, but with the cubes placed in a 3D fashion (in a 5x5x5 cube) this was possible. Therefore, Goethe held that colors are a 3D phenomenon. For a while the two positions seemed to be irreconcilable. But then, in the 19-th century, a solution was proposed by the physician Young and the physicist Helmholtz. They independently stated the hypothesis that the sensitive eye has three different kinds of receptors for color vision, each with its own sensitivity for the light spectrum. Then *one* wavelength λ gives rise to a *triplet* of reactions in the three different kinds of receptors. Hence light has both a 1D and a 3D aspect, depending on whether

one considers its production or its perception. Later the hypothesis of the three kinds of receptors turned out to be correct. Not only was the controversy settled, the obtained insight in the functioning in color perception also gave raise to the multi billion US\$ industry of color monitors, flatscreens and projectors. The moral is that both science and (trained) phenomenology are important and can reinforce each other.

4.2. Parallel and Serial Processing

The presence of the *cetas* in the Abhidhamma model emphasizes that consciousness has a strong serial component. The collaborating *cetasikas* point at a parallel processing.

It is well-known from neuro-psychological experiments that consciousness has parallel and serial aspects. Spotting a red letter on a page with further only black letters is instantaneous and therefore the mind works here in parallel. On the other hand if the task is to find a red T on a page with black T's and F's and further only red F's, one has to scan the possible candidates one by one, i.e. in a serial fashion.

A possible implementation in the brain of the serial discrete series of *cetas* is the firing of one group of neurons. Indeed, this firing is happening in discrete units. Also the action potential of each neurons has clearly an arising, existing and disappearing phase, which comes close to the described life cycle of a *ceta*. Some empirical evidence for the discreteness of consciousness is in Lehmann et al. [1998]. In this paper multichannel EEGs are studied by making a map of isopotential lines. It was observed that the 'landscape' makes a sudden change about every 100 ms.

The 1981 synchronicity hypothesis of von der Malsburg [1994] states that in order to represent an object in the brain, a population of neurons fire simultaneously. This then happens in a serial way: objects being formed one after the other. The similarity with Abhidhamma's model of the *cetasikas* and *cetas* is close.

The four types of kamma (producing, supporting, obstructing and destructing) fit very well with the well-known collaborating excitatory and inhibitory types of neurons. Finally the notion of accumulated kamma may be implemented by the development of new synapses between neurons.

4.3. Cover-up

If consciousness consists of a discrete stream of mental atoms, then it is likely that there is a mechanism that regulated and smoothed the transitions between the *cetas*. The idea of 'volume transmission', see Nieuwenhuys [2000], first formulated under a different name in Nieuwenhuys [1985], states that next to synaptic transmission in the brain from neuron to neuron, there is also a non-synaptic transmission, in which the chemical messenger is diffused over the extracellular space (volume) within the brain²². Indeed, the idea implies the

²²This idea has been specialized to the 'liquor hypothesis', which states that the cerebrospinal fluid plays the role of mediating volume. One of the reasons for this hypothesis is

possibility that the diffusing neurotransmitter of a particular kind may act as a neuromodulator. This may set the mind in a particular mood, so that there is not a high degree of variability. Stress hormones and opioids may play a role in the implementation of the unpleasant or pleasant cover-up as coping mechanism.

4.4. Purification

Given the Abhidhamma model and the possible way it is implemented in the brain along the lines sketched above, there is an inherent danger for a human being. The cover-up may fail, causing a dissociation with a panic effect that often may be a dissociation or a psychotic cover-up as emergency exit. The claim is that mindfulness can be developed as cure for some forms of distress, as it takes out the poison of kamma from the impersonal potentially chaotic process of consciousness. Evidence comes from *Mindfulness Based Stress Reduction* (MBSR) developed by Kabat-Zinn, see his [2003] for a review, and later *Mindfulness Based Cognitive Therapy* (MBCT), see Segal et al. [2002]. Kabat-Zinn emphasizes that therapists using MBSR and MBCT should have a pretty good experience with mindfulness meditation. This is an important remark for at least two reasons. Firstly the practice of mindfulness cannot be taught in an intellectual level, but needs a living example. The second reason is that it is important for the therapist to have first hand experience with the three characteristics of existence.

Another point to be made is that psychotherapy and mindfulness meditation are different methods going in the same direction. Undergoing psychotherapy may be compared to learning to swim, while practicing mindfulness corresponds to learning to dive. It is helpful when, coming up after the dive, swimming is within one's range of capacities. Now psychotherapy works towards building some form of stable ego. Meditation practice on the other hand leads to the ability to detach from this ego, depending on the occasion. First things first. But the simile also shows that there is a difference in scope. Therapy is good for acting in the world, for life, while meditation is good for one's total being, including the fact that we are mortal.

How mindfulness can be implemented in the brain may be speculated as follows. The phenomenon could be related to reflection, familiar from Gödel's self-referential statement or from the universal Turing machine. See Hofstadter [1979] or Barendregt [2005]. The important point is that reflection is a mechanism that is relatively simple and can easily be implemented by a network of firing neurons within one *ceta*.

that if opioids are placed in the liquor, then a peculiar anesthesia results: the pain remains but is no longer perceived as unpleasant. Exactly this phenomenon can be observed during concentration meditation. In Calle et al. [2005] it has been observed that in the periventricular parts of the brain there are many liquor contacting cells containing opioids and stress hormones.

Postscript

The Abhidhamma model of consciousness comes from a millennia long tradition of trained introspection and has been verified by meditators that have taken the effort to do the investigating work. This does not imply that science should believe that the model is ‘correct’: the role of science is to be skeptic. What we hopefully have shown, is that the model is of enough interest that it and its consequences deserve closer investigation. This not so much for a neurophysiological underpinning of effects of meditation, but more for a top-down and bottom-up inspiration for neurophysiology, coming from a serious phenomenological study of consciousness. The Abhidhamma model implies that neuroses, psychoses and an armored personality are natural phenomena, but also that there is a systematic training to go beyond these modes of living. How to do this is not discussed in the Abhidhamma. This is explained in the Suttas, one of the other parts of the Tipitaka. The method is also told in 888 pages by Buddhagosa [ca. 450/1999], neatly summarized in Bodhi [2000].

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