Abreaction Re-evaluated

Onno van der Hart, Ph.D. & Paul Brown, M.D.

Originally published in *Dissociation*, 1992, 5(3), 127-140. Posted at trauma-pages.com with permission of the author (OvdH) and the Journal Editor (R. Kluft). Onno van der Hart, Ph.D. is a psychologist in practice and with the Department of Clinical Psychology, Utrecht University, Heidelberg 1, 3584 CS Utrecht, The Netherlands.

Paul Brown, M.D., is a psychiatrist at the Pierre Janet Centre, Kew, Melbourne, Victoria, Australia.

Abstract

Contemporary clinicians working in the field of multiple personality disorder (MPD) generally agree that pathogenic traumatic memories are at the root of this dissociative disorder. Examination of contemporary studies, however, shows that diagnostic and therapeutic conceptualization remains muddled and frequently contradictory. This confusion stems back to Breuer and Freud's "Studies of Hysteria," in which they used two contradictory models concerning the nature and treatment of traumatic memories. The first model was in terms of dissociation and integration, processes which already had a French pedigree (particularly with Pierre Janet), and the second was their own model which they developed in terms of the principle of psychological constancy and abreaction. In the literature on trauma since Breuer and Freud, e.g., studies on post-traumatic stress during and after World Wars I and II and the Vietnam war, different authors have emphasized either one or both models. The present authors critically re-evaluate abreaction and advocate the dissociation-integration model as the basis for further conceptualization, discussing the role of emotional expression within it.

The treatment of traumatic memories is one of the core issues in the therapy of patients with multiple personality disorder (MPD). Many clinicians working with MPD patients have developed innovative and effective treatment techniques for dealing with this most difficult and demanding area. These techniques have also proven to be useful contributions to the treatment of other posttraumatic conditions. Such developments took place within the context of increased clinical and theoretical understanding of psychological trauma, memory processes, post-traumatic dissociation, and MPD itself.

Given these technical advances in the treatment of trauma in MPD, it is noteworthy that theoretical understanding lags well behind. It is exemplified by the persisting use of the controversial and, in the authors' view, outmoded concepts of abreaction and repression with regard to the treatment (including hypnotic) of traumatic memories (e.g., Braun, 1986; Comstock, 1986,1988; Putnam, 1989; Ross, 1989; Steele, 1989; Steele & Colrain, 1990).

This tendency to perpetuate outmoded concepts reflects a pre-existing state of affairs in North American psychiatry regarding conceptualization of the treatment of traumatic memories overall in all post-traumatic conditions. It is exemplified by the definition of abreaction adopted by the American Psychiatric Association:
An emotional release or discharge after recalling a painful experience that has been repressed because it was consciously intolerable. A therapeutic effect sometimes occurs through partial discharge or desensitization of the painful emotions and increased insight. (American Psychiatric Association, 1980, p. 1)

In this definition, abreaction is directly related to the similarly outmoded concept of repression. Some contributions to the North American literature on hypnotic treatment of traumatic memories in those with post-traumatic stress disorder (PTSD) or related disorders, adopt the same conceptual framework (e.g., Brende, 1985; Silver & Kelly, 1985), but others have taken leave from it and emphasize a more cognitive approach emphasizing integration (e.g., Brende & Benedict, 1980; Brown & Fromm, 1986; Erickson & Rossi, 1979; Kingsbury, 1988; MacHovec, 1985; Miller, 1986a&b; Mutter, 1986, 1987; Parson, 1984; Peebles, 1989). Spiegel, who writes on treatment of traumatic memories in both MPD and PTSD, similarly does not adhere to the "abreaction/repression" conceptual tradition (Spiegel, 1981, 1986, 1988, 1989).

The aim of this paper is to critically examine the use of the concept of abreaction by contemporary MPD clinicians, to trace its historical and theoretical roots, and to suggest an alternative conceptualization and language for understanding and description of the treatment of traumatic memories. In so doing, some attention is paid to the therapeutic techniques employed. The emphasis is, however, focused at a conceptual level and explores its degree of congruence with the therapeutic level. In the second of this series of papers, critical attention is directed at the concept of repression and its relationship to "dissociation." In a third paper, a tentative proposal will be made, based on Janet's theory of dissociation, for a comprehensive model which addresses the nature and treatment of traumatic memories.

Use of the Term "abreaction" in Contemporary MPD Literature

One of the first statements on abreaction and repression in the treatment of traumatic memories in MPD patients was made by Kluft (1982), when he said that hypnosis helped 57 percent of his patients:

... to abreact traumata or express repressed affects. A single intervention (abreaction), no matter how intense or prolonged, rarely allowed sufficient ventilation and relief. Sometimes several personalities had separate abreactive experiences of the same event or affect. (p. 235)

Since then, the term "abreaction" was used, either in passing or with full details, in most publications on the treatment of MPD. Thus, Fagan and McMahon (1984) in the treatment of children with incipient MPD, recommended that the therapist present past traumata in symbolic forms via play materials, thereby encouraging abreaction and the adoption of a more assertive and masterful stance in therapeutically elicited fantasies. Weiss, Sutton, and Utrecht (1985) described the treatment of a girl with MPD, during which amnestic barriers were eroded, and repressed memories were recovered, abreacted, and worked through. Kluft (1986) also referred to these authors, in distinguishing between abreaction and working through, and grief work.

The child must explore different facets of what has occurred and often mourns the loss of defensive idealizations, over-positive perceptions of their abusers, shorn of the negative and repressed aspects. (p.100)
Braun (1986) warned against the technique of abreaction without employing an appropriate cognitive framework, since it can activate traumatic memories for which the patient has no adequate defenses or coping skills. He recommended that emotions should be expressed in a planned, controlled and, therefore, a safer manner. Bliss (1986) regarded abreaction as a technique (often assisted by hypnosis) for the detailed reliving of traumatic early experiences, and as such, necessary for the subject's acceptance of the validity of these experiences. Ross (1989) regarded abreaction as an extremely painful, highly stylized dissociative recreation and enactment of the memory of a real trauma. To be healing, it should have a meaningful framework and it must be debriefed. Debriefing may involve touch, holding, reassurance, and hypnotic suggestions for sleep, calm, or safety.

An abreaction is malignant when it consists of chaotic, uncontrolled runs of screaming, self-abusive, or regressed behavior during which the patient may switch rapidly. There is no learning or transfer of meaningful information to other personalities. (p.248)

Ross observed that the risk of malignant abreactions is especially high in inpatient work.

In two treatment-oriented papers, Comstock (1986, 1988) appeared to differentiate symptomatic flashbacks from therapeutic re-experiencing of trauma, which she called abreaction. She distinguished five therapeutic purposes (at times overlapping) for these abreactions: (1) to provide information to other alter-personalities than those which previously experienced abuse, (2) for (re)-education, i.e., the remediation of distorted thinking patterns which were established during an abusive episode, (3) to release (or to complete the release) of psychosomatically repressed affects, (4) to associate the actual contents of the abuse with their corresponding feelings, so that the subjects discover what happened, and (5) to release any somatic symptoms of any physically encapsulated trauma. Comstock implied that these purposes served the patient's inner needs (which were not always immediately clear) rather than those purely attributed by the therapist. She considered such abreactions as natural occurrences facilitated during treatment, but which may be blocked by several factors, e.g., chaotic intermingling of the whole system of alter-personalities, alters becoming overwhelmed, emergence of protective alters, and prohibitive counter-transferential responses.

Many critical discussions of the utility of the concept of abreaction have appeared in the course of this century. In his presentation and review of the literature, Putnam (1989) mainly included those publications which accepted and endorsed it. In his own work, he followed the APA (1980) definition of abreaction mentioned above. He distinguished between spontaneous abreactions (or abreaction-like phenomena), and therapeutically controlled abreactions. For him, flashbacks, vivid dreams, and other vivid recalls of traumatic experiences are to be considered as abreaction-like phenomena, whose spontaneous, uncontrolled, and largely unconscious nature "prevent or impede any emotional relief that might occur from the discharge of memory and affect accompanying the flashback" (Putnam, 1989, p. 237). With regard to treatment, Putnam emphasized the importance of reliving of the traumatic experience as well as the discharge of related affects. In accordance with Kluft (1982), he also stressed the need, in most instances, to repeatedly abreact a given experience over a number of sessions. During these sessions, the patient may relate very different versions of the same event, and express widely divergent emotions belonging to different alters. Understanding and resolution of such contradictions are often instrumental in the patient's acceptance and integration of the uncovered material. For the purpose of integration, Putnam also stressed the need to bring the traumatic
material (relived through abreaction [sic]) into waking conscious awareness within a short time after the abreactive experience.

At the same time that Putnam (1989) used the concepts of abreaction and discharge of affect, he also employed a quite different approach in parallel, an approach in which not the discharge of affect but its reintegration along with other elements of the traumatic experience was central:

During the abreactive episode, the therapist should help the patient to "feel" these dissociated affects and physical sensations. This can be done by simply inquiring periodically during the abreaction about what the patient is feeling, in addition to asking for the details of the experience. The therapist should make every effort to help the patient recover, re-experience, and re-integrate split-off affects and somatic sensations, as these are probably the most potent sources of everyday discomfort and dissociative behavior, (pp. 246-247)

Steele (1989) presented what she called a conceptual model for abreactive work with MPD and other dissociative disorders. This can also and perhaps better be considered a stage-oriented model for the treatment of traumatic memories in MPD, since it clearly details the following five phases: (1) providing safety and protection (preparation), (2) eliciting dissociated aspects of the trauma (identification), (3) alleviating the existential crisis or fixation point of the trauma (resolution), (4) creating a new gestalt, including the dissociated aspects within a reconstructed cognitive schema (assimilation), and (5) empowering the patient (application).

In Steele's model (1989) there is no place for the concept of repression. Instead, she focused more appropriately on the dissociated aspects of the traumatic experience, aspects which have to be identified and then assimilated. However, with regard to the concept of abreaction she remained unclear. She mentioned that separate aspects of the traumatic experience can be kept separate by different alternate personalities or personality states.

These personalities and states must be accessed and discharged of the energy related to the trauma. However, catharsis, in itself, is not sufficient to resolve the trauma. In order for abreactive work to be effective, catharsis must be linked with cognitive restructuring, and with the resolution of existential dilemmas inherent in the trauma, (p. 154)

By describing the whole five-phase treatment of traumatic memories "abreactive work," Steele adopted the principle of metonymy, i.e., she condensed all aspects of treatment, including the ones unrelated to abreaction, under its rubric. The same is true for Fine (1991), who stated that the purpose of abreaction is:

to inform, to educate or to re-educate, to release the repressed affect, to achieve continuity of memory content, to release somatically encapsulated trauma, and to re-formulate cognitive schemata and beliefs, (p. 672)

There is nothing wrong in principle with using such a figure of speech. However, as shall be argued below, it is contended that those clinicians using it choose the wrong pars pro toto.

In an excellent chapter, Steele and Colrain (1990) presented a more extensive and detailed description of Steele's stage model. The concept of repression, however, reappeared, and along with it abreaction was described as:
Steele and Colrain (1990) adhered to the tendency among MPD clinicians to explain most aspects of traumatic memories in terms of abreaction. They regarded flashbacks and unrelated phenomena as spontaneous abreactions, which they defined as: "a reflexive, incomplete, uncontrolled, and fragmentary re-experiencing of trauma, with much of the content occurring unconsciously" (1990, p. 19). According to Colrain and Steele (1991), it is the incomplete nature of a flashback (or related phenomena), as well as the lack of an accompanying cognitive framework which prevents its resolution. Peterson (1991) considered these "spontaneous abreactions" to be closed physiological loops that offer no relief, but are only repeated over and over again.

Conclusions. The greater majority of MPD clinicians writing on the treatment of traumatic memories do so in terms of abreaction and abreactive work. They are also inclined to describe flashbacks and related intrusive recall in terms of spontaneous abreaction. On the one hand, they emphasize the expression and release or discharge of affect during the revivification of traumatic memories. On the other hand, however, they also recommend that revivification should enable the patient to re-integrate dissociated parts of the original trauma, i.e., traumatic memory, and to assimilate the traumatic event into the whole of their personality. In guiding the patient through this process, they provide a cognitive framework for meaning-attribution and as well described by Steele and Colrain (1990) treatment usually follows a series of phases. Confounding of abreaction with integration is well exemplified by the combined title of Peterson's presentation on "Hypnotic techniques recommended to assist in associating the dissociation: Abreaction" (1991). Associating the dissociation is not abreaction. It is the authors' contention that progress can only be made by clarifying and appropriately restricting the use of the term "abreaction." There are similar difficulties to overcome with the term "repression," difficulties which will be dealt with in a subsequent paper.

An Historical Review of the Concept of Abreaction

Breuer & Freud

Abreactive treatment, emphasizing catharsis, is generally seen as originating in the work of Breuer and Freud (1895/1974), and in particular with Breuer's famous case of Anna O. during the early 1880's. Although Ellenberger (1970) drew attention to Janet's (1886) earlier example of this approach with his patient Lucie, this discussion is only concerned with the initial work of Breuer and Freud. In a thorough study, Macmillan (1991) argued that Breuer's first description of the Anna O. case was significantly different from later accounts in placing little or no emphasis upon elicitation of unexpressed emotions (see also Hirschmuller, 1978). He stated that there is little indication that what Anna O. called her "talking cure" required her to "abreact" while she recalled and relived the emotionally charged circumstances under which she had acquired her symptoms. Nowhere in his initial descriptive notes did Breuer stress emotional expression. Rather, it seems that this dimension was later added by Breuer and Freud (1895/1974).

Nevertheless, Breuer and his patient Anna O. could well have been aware of the notion of catharsis. One of the first to use this term was Aristotle in his Poetics (VI)
(cf. Hardison, 1968), where he ascribed to catharsis an essential role in tragedy. According to Macmillan, what Aristotle actually meant by catharsis remains equivocal. It probably referred to purging by a reduction of emotions, such as experienced by an audience watching a theatrical tragedy. In this way, catharsis "purified" emotions such as pity and fear so that the audience could both derive satisfaction and also, as with other dramatic forms, learn from the events (Hardison, 1968; quoted by Macmillan, 1991, p. 22).

Bernays (1857/1970) proposed a "medical" interpretation of Aristotle's catharsis doctrine, and this stimulated great interest and wide acceptance among Viennese intellectuals, both upon its original publication and following its re-publication in 1880 the year that Breuer commenced his treatment of Anna O. (Hirschmuller, 1978). For Bernays, purging came about not because of a mere reduction of the [pitiful and fearful] emotions but because of an emotional discharge. Watching a tragedy on stage, discharged pity and fear from the soul, resulting in a transient relief and over a longer (but not permanent) period quieted the disturbing feelings. Macmillan (1991, p. 23) remarked that within this context catharsis does not seem to require the audience to express the emotions portrayed in the tragedy so much as to experience them. The spectator by merely watching a tragedy would experience catharsis.

Breuer originally emphasized verbal over emotional expression of feelings. Emotional expression was added later (Breuer & Freud, 1895/1974). Freud first used the term "abreaction" in a letter to Fliess on June 28, 1892, reporting that Breuer had agreed to publish their "detailed theory of abreaction, and our other joint witticisms [Witze] on hysteria" (Masson, 1985, p. 31). In this, Freud (1892/1963) actually followed the French school of dissociation as exemplified by Charcot (1887) and Janet (1889, 1892). He stated that attacks of hysteria are the manifestations of traumatic memories, memories which belong to a second state of consciousness.

If we can succeed in bringing such a memory entirely into normal consciousness, it ceases to be capable of producing attacks. During an actual attack, the patient is partly or wholly in the second state of consciousness. In the latter case the whole attack is covered by amnesia during his normal life; in the former case he is aware of the change in his state and of his motor behavior, but the physical events during his attack remain hidden from him. They can, however, be awakened at any time by hypnosis. (Freud, 1892/1963, p.31)

It is noteworthy that Freud's position here still remains completely within the dissociation framework. The same is true for Breuer and Freud's (1893/1974) subsequent formulation of the essence of hysteria:

The splitting of consciousness which is so striking in the well-known classical cases under the form of "double conscience" is present to a rudimentary degree in every hysteria, and that a tendency to such a dissociation, and with it the emergence of abnormal states of consciousness (which we shall bring together under the term "hypnoid"), is the basic phenomenon of this neurosis. In these views we concur with Binet and the two Janets. (p. 63)

The dissociation theory as employed here is a rather descriptive model, both with regard to the experience of trauma, the persistence of traumatic memories, and the general characteristics of (posttraumatic) hysteria. With regard to the mental processing of trauma, Freud (1892/1963) developed yet another principle that of "constancy." This is where the conceptual problems began.
The nervous system endeavors to keep constant something in its functional condition that may be described as the "sum of excitation." It seeks to establish this necessary pre-condition of health by dealing with every sensible increase of excitation along associative lines or by discharging it by an appropriate motor reaction. Starting from this theorem, with its far-reaching implications, we find that the psychical experiences forming the content of hysterical attacks have a common characteristic. They are all of them impressions that have failed to find an adequate discharge, either because the patient refuses to deal with them for fear of distressing mental conflicts, or because (as is the case of sexual impressions) he is forbidden to do so by modesty or by social circumstances, or finally because he received these impressions in a state in which his nervous system was incapable of dealing with them. In this way, too, we arrive at a definition of psychical trauma which can be employed in the theory of hysteria: any impression which the nervous system has difficulty in dealing with by means of associative thinking or by motor reaction becomes a psychical trauma, (p. 32).

Only in 1920, however, did Freud return to this principle of constancy (Freud, 1920/1950), when he argued that affects owe their aetiological importance to the fact that they are accompanied by the production of large quantities of excitation, and that these excitations in turn call for discharge in accordance with the principle of constancy. Traumatic experiences owe their pathogenic force to the fact that they produce quantities of excitation which are too large to be dealt with in the normal way. Treatment of traumatic memories by abreaction is thus based upon this more fundamental principle of constancy, i.e., the quantity of excitation must be kept constant (cf. Strachey, 1974, p. 38). Breuer (1895/1974, p. 277) argued that all powerful affects restrict association, i.e., the continuity of ideas. The excitation cannot be leveled out by associative activity. Affects that are "active" (strong or "sthenic") such as anger, level out the increased excitation via motor discharge. "Asthenic" (weak) affects, however, such as anxiety, are unable to bring about this reactive discharge. Instead, they paralyze the power of movement as well as that of association. Breuer argued for abreaction through facilitating verbal expression alongside emotional discharge through motor activities. Freud preferred verbal expression.

Conclusions. Breuer and Freud (1893) were initially in agreement with their French colleagues in regarding dissociation, i.e., the splitting of consciousness, as the fundamental characteristic of hysteria. Traumatic memories were seen as dissociative in nature and, as such, giving rise to (post-traumatic) hysteria. Breuer and Freud hinted at the notion that treatment should incorporate the resolution of this traumatically-induced dissociation, by verbally associating split-off traumatic memories with the rest of the personality. However, following the introduction of their quasi-neurological model based on the "principle of constancy," they developed a treatment technique, the abreaction, or discharge of the surplus of "excitation." The key problem here is to relate the latter abreaction-catharsis model based on the discharge of excitation and the principle of constancy with the association-reintegration therapeutic model based on the concept of dissociation. As previously mentioned, there exists a consensus at least among contemporary therapists of MPD and other post-traumatic states that abreaction alone and in itself is not curative. Many of these patients regularly enter states during which they partially or completely re-experience trauma, without any resolution whatsoever. Reversing the dissociation and integrating the traumatic experience must be the therapeutic goal. The question remains, however, if and to what degree abreaction is required in treatment aimed towards this goal.

Breuer and Freud had put too much emphasis on abreaction, and Freud early abandoned the dissociation model altogether. Subsequent generations of trauma
therapists all too readily called upon the "cathartic method" and forgot all about the issues of resolving dissociation and integration of traumatic memories. This was the case, for example, during World War II, when both hypnotic and chemically-induced abreactive techniques were widely used. The need for this resolution of dissociation and integration of traumatic memories was, in fact, much better understood by a group of military psychiatrists during and after World War I.

**World War I and It's Wake**

World War I saw a great need for rapid psychological treatment intervention with traumatized combat soldiers. Hypnosis was widely used, not only for symptomatic treatment (e.g., Nonne, 1915), but also for the more thorough resolution of traumatic memories (Brown, 1918, 1919; Myers, 1915, 1916; Sauer, 1917; Simmel, 1918). Myers used hypnosis as an exploratory technique in cases where post-traumatic amnesia existed. Once the trauma was uncovered, the patient was encouraged, first in hypnosis and then in the waking state, to become aware of the experience and describe it to the therapist. Myers, who did not encourage emotional expressiveness during this process, reported "excellent results" (Myers, 1920/1921).

A number of German and English military psychotherapists utilized variants of Breuer and Freud's "cathartic method." Sauer (1917) modified the cathartic approach developed by Frank (1913) (cited by Sauer), called "psychocatharsis," which consisted of "abreaction in a hypnoid state."

I try to produce a superficial sleep of such a kind that the upper consciousness is preserved and limited to such a degree that the images of scenes experienced earlier, rising from the unconscious and as a rule strongly coloured by emotion, are clearly seen and relived with the emotion belonging to them. (p. 25) (cited by Eissler, 1986, p. 320).

Simmel (1918) initially employed symptom-oriented hypnotherapy. However, encountering resistance in the "numerous patients who had hitherto, despite long and careful medical effort, showed themselves to be impossible to be influenced," he treated them by the cathartic method. He facilitated the hypnotized patient's return back to the traumatic situation, enabling him to experience the past again along with all the associative details which had been lost to his conscious memory (cf. Eissler, 1986, p. 321). Much later Simmel (1944) wrote that at the time he felt that the symptoms of war neurosis arose largely through the repression of aggression. Using hypnosis he not only made the soldiers remember past traumas but also gave them the opportunity to act out the transformation of their fear into anger. As soon as the patient was hypnotized, he was presented with a stuffed dummy:

I register it always as the beginning of the cure when the patient's initial fear of this dummy finally turned into rage, resulting in the dummy's partial mutilation or complete destruction, (p. 245)

Brown (1918, 1918) drew attention to the dissociative nature of traumatic memories and to the value of abreaction in resolving them.

The patient goes through his original terrifying experiences again, his memories recurring with hallucinatory vividness. It is this which brings about the return of his powers of speech, and not direct suggestion, as is the ordinary method of hypnosis. (...) Remembering that his condition is due to a form of dissociation and that in some cases hypnotism accentuates this...
dissociation, I always suggest at the end of the hypnotic sleep that he will remember clearly all that has happened to him in his sleep. More than this, I wake him very gradually, talking to him all the time and getting him to answer, passing backwards and forwards from the events of his sleep to the events in the ward, the personalities of his sister, orderly, doctor, and patientsi.e., all the time re-associating or re-synthesising the train of his memories and interests. (Brown, 1918, pp. 198-199)

In a second paper, Brown (1919) emphasized the need for emotional expression while going through traumatic war experiences. A third paper (Brown, 1920/1921) provided the introduction to an important discussion in the British Journal of Medical Psychology entitled "The revival of emotional memories and its therapeutic value." With regard to the treatment of shell-shock, especially those patients suffering amnesia for incidents immediately following the shell-shock, Brown (1920/1921) stated that "if these memories are brought back again afterwards with emotional vividnesso hallucinatory vividness, I might sayo the other symptoms which they are showing tend to disappear." (p. 16) Brown further added:

Another obvious factor, of course, is the re-synthesis of the mind of the patiento the amnesia has been abolished, and the patient has once more full sway over his recent memories. (p. 17)

He also felt that emotion had been pent up under the strain of attempted self-control. The liberation of this pent-up emotion produced a resolution of the functional symptoms. Brown appeared to believe that post-traumatic dissociation is resolved according to Breuer and Freud's model of abreaction and the principle of constancy. Other authors criticized this position. Thus, Myers (1920/1921) indicated that Brown was incorrect in his belief that "bottling up" of emotional expression was the prime cause of dissociation. He wrote that Brown was thus incorrectly led to think that:

the revival of emotional expressions was the most important element, while my own [i.e., Myers] experience, in recovering memories both in the waking and in the hypnotic state, was that the acting out of the emotional experience was of relatively little consequence, but that what was of importance was the revival of the unpleasant memory of the scene, i.e., the revival of the dissociated affective and cognitive experience. (p. 20)

Myers discouraged undue prominence of the emotional response during the recollection in hypnosis. One of his instructions to prevent too much emotion was worded as follows:

Now when I put my hand on your forehead, you will be back in the trenches again, but you will not be unduly afraid, you will be able to live through it all again calmly and to tell me all that happened to you. (p. 20)

Re-synthesis, to use Brown's expression, was achieved according to Myers by recall of the traumatic memory, not by "working out" of the "bottled up emotional energy," as Brown had believed. Myers, however, failed to point out explicitly the precise nature of the active ingredient in this recall, facilitating re-synthesis. He appeared to point to the patient reliving the trauma, while being able to stay calm and relate what had happened, i.e., a form of linguistic mastery of complex relived cognitive-emotional post-traumatic mental states.

McDougall (1920/1921, 1926) felt that abreaction is a highly questionable and improbable explanation for cure or even symptomatic relief of post-traumatic
disorders. He criticized the Freudian conception of emotion as a quantum of energy (comparable to a charge of electricity) which could become attached to any idea. Each emotional memory would then imply the existence of a separate and distinct pocket of explosive energy in the mind (or in the nervous system), attached to the memory and serving the function of a "detonator." By abreaction, this disturbing pocket of energy would be discharged and eliminated from the system.

McDougall remarked that this explanation is contradicted by two facts: (1) Some traumatized patients frequently relive their experiences without securing an "abreaction." Rather, these repetitive episodes seem to worsen the patient's condition, which tends to become chronic and fixed. (2) Some patients, "having come into the hand of a medical officer who accepted the principle of 'abreaction,' have been put through their paces again and again, i.e., have been made to live through the disturbing experience repeatedly in hypnosis, and have shown increase rather than relief of symptoms" (McDougall, 1920/21, p. 25).

Like Myers, McDougall believed that the essential step is the relief of the dissociation, in other words, the re-integration of traumatic memories (Myers 1920/1921). The terms re-synthesis and re-integration, incidentally, imply the incorrect notion that the traumatic memory had, at one point, not been dissociated. Emotional discharge is not essential to this, although it plays a part in bringing it about, e.g., by triggering and revitalizing the train of recollection, and by overcoming any repressive tendencies which tend to maintain the dissociation. That it plays no essential curative role is indicated by those cases in which relief of dissociation and consequent general improvement is effected without appreciable emotional display. Nevertheless, for relief of dissociation, there must also be a complete recollection of the traumatic experience in all of its details, including the emotional component. (McDougall, like Janet (1907), thus anticipated Braun's BASK Model in the treatment of traumatic memories (cf. Braun, 1988a, 1988b).

Jung (1921/1922) spoke of complexes, i.e., traumatic memories as the pathogenic factor in posttraumatic disorders. He regarded the notion of an emotional charge as the element which has to be released in therapy as an inadequate view. He, too, recognized that there are many cases in which abreaction not only was of little use but was indeed actually harmful. Jung concurred with McDougall and Myers that the essential factor in posttraumatic disorders is psychological dissociation and not the existence of high-tension affects.

A traumatic complex creates a dissociated condition of the psyche: it is removed from the control of the will and therefore possesses the quality of psychical autonomy. (p. 15)

In this, Jung was pursuing the approach adopted by one of his early mentors, Pierre Janet (1889, 1898), who saw the essential goal of therapy in post-traumatic disorders as the integration (Brown spoke of "re-synthesis," Myers of re-integration," and McDougall of "relief") of the dissociation, and not abreaction (although this may play a facilitative role). Ultimately, by reliving the traumatic experience, either once or repeatedly, the traumatic memory is gradually accepted as a content of consciousness. It is not merely the rehearsal of experience that has an unconditional curative effect, however, but rather its rehearsal in the presence of the physician. The support and understanding of the therapist increases the patient's level of awareness and consciously enables him once again to bring the autonomous dissociated traumatic memory under volitional control.
At the same time as the conceptualization and treatment of the combat neuroses was proceeding, the Dutch psychiatrist Breukink independently reported successful experiences in the hypnotic treatment of post-traumatic psychotic states, in particular so-called hysterical and degenerative psychoses (Breukink, 1923, 1924, 1925). His reports validated the views held by Janet, Myers, McDougall, and Jung, i.e., that integration of the traumatic experience rather than abreaction is an essential element in the treatment of traumatized patients. His own cathartic-hypnotic method consisted of directing the patient to the traumatic memories underlying the psychosis, thereby permitting the calm and conscious elaboration of the traumatic sequence of events. These events were fully discussed under hypnosis, Breukink finally suggesting that the patient would remember everything upon returning to the waking state, when the events could once again be told and discussed. Breukink used the word "catharsis" to mean emotional "extinction," rather than in the sense of emotional abreaction—a process of which he was particularly wary with psychotic patients (cf. Van der Hart & Spiegel, 1993).

**Conclusions.** During and after World War I, a number of military clinicians used hypnosis to go beyond symptomatic treatment and therapeutically addressed traumatic memories per se. In their choice of therapeutic principles and techniques, they opted for either of two explanatory models: one, the dissociation model, originated in French psychiatric traditions, notably with Janet, and the other with Breuer and Freud's abreaction model. Those clinicians adhering to the dissociation model regarded resolution of dissociation by integration of traumatic memories as the primary treatment goal. They varied in their views as to the degree to which the expression of emotions could either help or hinder the attainment of this goal. Some emphasized its destructive effects, preferring therefore to facilitate a calm mental state while traumatic experiences were relived, while others believed emotional catharsis could, at least in some cases, promote this "re-integration." All were well aware of refractory cases, associated with treatment by purely abreactive techniques alone.

**World War II and It's Wake**

In the period up to World War II, the importance of resolving post-traumatic dissociation over abreaction of "pent-up" emotions was mostly forgotten. Thus Culpin (1931), later quoted by Shorvon and Sargant (1947) and by Putnam (1989), remarked in discussing his own treatment experiences in World War I:

> Once a man's conscious resistance to discussing his war experiences was overcome, great mental relief followed the pouring out of emotionally charged incidents. It was as if the emotion pent up by his conscious resistance had by its tension given rise to symptoms. The memory, usually of a nature unsuspected by me, then came to the surface, its return being preceded perhaps by congestion of the face, pressing of the hands to the face, tremblings, and other bodily signs of emotion. (p. 27)

During World War II, most clinicians treating acute war neuroses, therapeutically adhered to abreaction, i.e., to Breuer and Freud's second model. Only a few clinicians, such as Kardiner (1941), were critical of this model and pursued a more cognitive treatment approach. During the 1930s, barbiturates (sodium pentothal, sodium amytal, and related drug preparations) were introduced into psychiatry. They were initially used to promote sleep and subsequently to facilitate techniques aimed at accessing concealed difficulties (Patrick & Howells, 1990). During World War II, this usage led to drug-facilitated abreaction as the treatment of choice for the war neuroses.
Sargant and Slater (1940, 1941) were among the first to do so in their treatment of psychiatric casualties following the British retreat from Flanders and the evacuation from Dunkirk in 1940. Debenham, Hill, Slater, and Sargant (1941) [cited by Shorvon & Sargant, 1947] recommended that barbiturates be used to encourage the patient to "re-experience the violent emotions that battle scenes have aroused." Shorvon and Sargent (1947) described the same technique instead using ether and gave its rationale in some detail. They explained to the patient that the treatment was aimed at freeing and releasing of pent-up emotional tensions which were themselves giving rise to symptoms.

A firm well-padded couch or bed is essential or the patient may hurt himself during his excitement, and it is wise to have a sufficient number of nurses or doctors present to control the patient. If this is not done, it may be impossible to carry on the abreaction if the patient is violent or struggling and shouting.

Shorvon and Sargant were so convinced of the therapeutic value of emotional abreaction, that in cases which in their view did not manifest adequate emotional excitement followed by emotional release, they would even suggest false (or, more traumatic) scenarios. In short, they would go to any length to "produce the required degree of abreaction." This was determined by the patient's subsequent degree of exhaustion and "collapse," itself called (after Pavlov) "the stage of complete inhibition." Shorvon and Slater not only reported their successes but also mentioned their failures. Thus, chronic posttraumatic cases stress suffering from obsessional or hysterical neuroses did not, as a rule, benefit from ether abreaction.

Other authors did not go to the same extreme. Thus Grinker and Spiegel (1945) emphasized the need to integrate traumatic material into the conscious ego. This was reflected in the title given to their treatment approach, narcosynthesis. These authors remarked that when a narcotic abreaction is not followed by integration by the ego, narcosynthesis cannot be said to have occurred. This was indeed often reflected by the failure of symptomatic improvement to occur. It was also considered necessary for the patient to remember the trauma in the waking state, and to "work through" the material in subsequent treatment sessions. In contrast to Shorvon and Sargant who recommended the achievement of maximal excitement during abreaction for adequate emotional release, Grinker and Spiegel using pentothal believed that the curative factor was quite the opposite and due to "the quieting effect of the sedation." This prevented the patient from emotionally reliving the trauma as if it were very dangerous (p. 393). Together with support from the therapist, this technique enabled the ego to integrate the ego-alien emotional experiences. Grinker and Spiegel also noted that following trauma other non-traumatic feelings might also become dissociated. Narcosynthesis could also be employed for the "recapture" of these unrelated but equally dissociated feelings.

Rosen and Myers (1947, p. 162) supported Kubie's earlier position (1943), in which he stated:

.. .whatever the method used, whether it is in hypnosis alone, hypnosis under narcosis, or hypnagogic reveries with or without narcosis, the recovered material must be fully fused with its emotional content and with normal waking consciousness. (p. 595)

Rosen and Myers were not impressed with the results of abreaction or catharsis alone. They had seen too many treatment failures and felt that abreaction was merely one stage in treatment, and that a complete reorientation of the total personality was
required. Klein (1949) also voiced his concern about drug-facilitated, "forced" abreactions, albeit for other reasons:

At first an attempt was made, in keeping with the work of Grinker, to use the method he described as narcosynthesis. After a fair number of trials, however, this was given up as it was found to have no advantage over simple but adequate sedation, and in the hysterical cases over the method of hypnotic suggestion. Indeed, in many of the patients it was felt to be detrimental to the patient's early recovery. What these men wanted most was not to be reminded of their grievous ordeal or horrifying experiences, but rather to be permitted the healing anodyne of merciful forgetfulness. (...) The so-called "abreaction" is a neat term implying an analogy of draining off disturbing emotional states with that of pus from a boil. This implication was found to be specious and poorly founded. (p. 39)

Klein believed that the therapist's reassurance and verbal support were more important.

Other military clinicians were in favor of hypnosis over drug-facilitated abreaction. Fisher (1943) believed hypnosis could be used in three ways: (1) by giving direct suggestions, (2) by bringing about abreaction of repressed affect, and (3) by breaking through resistance and making conscious of dissociated or repressed thoughts. Only the third way was considered indispensable for genuine cure. It was also the most difficult to carry out. His failure to distinguish between dissociation and repression may be noted. In contrast, Alpert, Carbone, and Brooks (1946) only believed in the element of hypnotic abreaction, in that it helped the "powerful pent-up affect to be released." The emphasis was on the full expression of emotions, which, it was felt, led to the removal of symptoms. They favored hypnosis over chemically-induced abreaction, since with hypnosis the therapist could better control the emotional intensity of the abreaction:

Once the drug was administered and the violent abreaction initiated, the action was irreversible and, on occasion, might result in actual bodily injury to the patient or the attendants, even necessitating restraint; whereas under hypnosis, a few words from the therapist adequately and immediately controlled the situation. (p. 323)

Watkins (1949) included abreaction among a wider range of hypnotherapeutic techniques. He defined it as the emotional reliving or re-enacting of traumatic experiences, and likened it to lancing a boil. As such, it involved a great expenditure of energy and a release of anxiety. Although his primary interest was its use in the treatment of war neuroses, Watkins observed that it was often also possible to enable the patient to project so-called repressed hostilities toward father, mother, wife, brother, sister, or friend. This not only afforded a certain amount of relief, but also provided a great deal of valuable information about the inner motivational structure in which the trauma was embedded. Patient participation was most complete and abreaction most valuable and effective when dramatic and emotive suggestions were utilized. However, it was also essential that the release of guilt, rage, or fear was followed by insight and by a total intellectual and emotional integration. Watkins also helped the patient to make the original traumatic situation more acceptable to the patient, much in line with Janet's original substitution technique (Janet, 1919/1925 [see under Janet, 1919], cf. Van der Hart, Brown, & Van der Kolk, 1989);
an emotionally corrective experience is undergone which "completes" the unfinished strivings, which are the repetitive core of the neurosis, and relieves the need to continue its symptomatic manifestations. (p.105)

**Conclusions.** This review of the World War II literature on abreaction demonstrates that the lessons which were drawn after World War I on the insufficiency of emotional abreaction were largely forgotten. Several influential authors fell back on the outmoded approach of discharging pent-up emotions. Shorvon and Sargent, in order to obtain complete emotional exhaustion, or when working with resistant cases, went so far as to suggest the use of even more traumatic scenes than those which had actually been experienced. One wonders whether these patients might well have been exposed to re-traumatization. When a "cure" was reported, it could well have followed a further dissociation of the traumatic memory, i.e., a retreat into health rather than integration.

As Rosen and Myers (1947) not surprisingly remarked, a number of clinicians discovered that the results of abreaction per se were "not impressive." On the other hand, Klein's (1949) conclusion that reassurance and verbal support were the principle curative ingredients, can be seen as an example of "throwing the baby away with the bathwater." While these factors should be part and parcel of therapy, they are not by themselves sufficient in the treatment of traumatic memories. Watkins (1949) largely attributed failures of abreaction to inadequate patient participation and to failure of subsequent personality integration. Abreaction treatment successes were frequently observed in cases of acute war neuroses, but the results with chronic cases were invariably very poor indeed. It is therefore a curious twist of historical fate that abreaction is again given so much prominence in the context of the treatment of rather chronic trauma-induced disorders such as MPD.

Watkins' definition of abreaction, which focused on the emotional reliving of traumatic experiences, portended a misleading tradition among many clinicians treating MPD patients, who now call all re-enactments of traumatic events "abreactions." Intrusive imagery, revivifications and flashback phenomena are thus called "spontaneous abreactions," and when the patient is instructed to relive a traumatic experience in the context of psychotherapy in a planned and structured manner, they speak of a "planned abreaction."

**Use of Abreactive Techniques Following World War II**

The literature on abreaction following World War II not only continued to cover the war neuroses, but was also extended to several other diagnostic categories. Wolberg (1945) found that hypnotic abreaction with neurotic patients was not successful. By contrast, Hordern (1952) applied abreactive techniques to non-traumatized "neurotic personalities," suffering only from "emotional tension." He believed that "satisfactory complete discharge of emotional tension may in many cases effect symptomatic improvement in a non-specific manner analogous to that of modified insulin." (p. 630). He did not consider it equally necessary to push the patient to the point of complete "inhibition" described by Shorvon and Sargent (1947).

In emphasizing "therapeutic re-integration," Zilboorg (1952) took the opposite position:

It [therapeutic re-integration] must be not only an affective experience but an affective process, a series of affective reconstructive experiences coming from within the psychic apparatus and not from without. (p. 22)
Conn (1953) was in agreement with this. He defined insight as "a state of ego functioning which results when the pathogenic agent has been removed, dropped, or lost." (p. 31) He felt that it was possible for the patient to "quietly discuss his harrowing experiences" and thereby to obtain benefit.

It is not the recall of the traumatic experience which is of therapeutic value, but the patient's acceptance of what he thought, felt, and did without the need for neurotic defenses. (p. 31)

Lifshitz and Blair (1960) defined abreaction as an extremely marked affective, non-intellectual, re-experiencing of previous perceptual impressions. They believed that repeated hypnotic abreactions, when considered as conditioned responses, are subject to the law of extinction, and their single case study appeared to confirm this position. They followed Shorvon and Sargent (1947) in assuming that an extreme emotional discharge would lead to a stage of cortical inhibition.

**Conclusions.** A number of publications indicated that abreaction techniques were ineffective in the treatment of non-traumatized, neurotic patients. They nonetheless reflected the pre-existing dichotomy between, on the one hand, the hydraulic model of the mind and belief in the therapeutic value of freeing pent-up emotions, and, on the other hand, the model of divided consciousness and the primary need for acknowledging and integrating dissociated traumatic memories. The clash between the dissociation/integration model and the abreaction model had not yet resolved.

**The Vietnam War and it's Wake**

Yet another war, in Vietnam, with its vast numbers of casualties, renewed interest in the treatment of posttraumatic disorders. This time, abreactive techniques and their concomitant hydraulic model of the mind were rejected in favor of treatment methods fostering integration of traumatic memories into the whole personality. Thus, Horowitz (1973) stated that the primary treatment emphasis should be on integration, not on emotional expression. Reflecting on the application of abreactive techniques during World War II, Horowitz (1986) concluded that:

Abreaction led to more abreaction, to seemingly endless accounts, all related to the traumatic neurosis but with little apparent improvement. Abreaction may relieve anxiety, but this effect can be non-specific and transient. To obtain durable improvement, it seems necessary to understand the individual patient, the meaning of the experience in relation to the continuum of his life, and to revise discrepancies in self-object representations and other organizing constructs. Rest, recreation, and re-socialization were found to be necessary additions, probably as techniques for reducing intrusive and repetitive syndromes and associated psychosomatic symptoms and for reassuring the person that he was not ostracized by his peers. Finally, support of the coping and defensive process appeared to be important in the acute phases (...). (p. 119)

Brende and Benedict (1980) reported on a several staged hypnotherapy in a delayed stress response syndrome in a Vietnam combat veteran. During the second stage, hypnosis was used to achieve age-regression. They described this as "more than a cathartic treatment." The curative factor was seen as the facilitation of ego-integration of "split-off feelings, particularly of fear and rage.
Spiegel (1981) used hypnosis in the treatment of Vietnam combat veterans as a means of resolving traumatic grief. Treatment facilitated recollection, not only of the death trauma, but also of positive memories of the lost comrade. The patient was encouraged to strongly experience the traumatic emotions, but this was not seen as an end in itself but rather as a necessary step towards ego-integration.

The intensification of memory and the emotion which surrounds it in hypnosis can be used as part of the process of doing grief work. The trance state provides a structured intensification of memory which becomes the setting for repeating and working through, or putting into perspective painful memories and experiences. (p. 35)

In an important chapter on the hypnotic treatment of PTSD, Brown and Fromm (1986) critically examined the role of abreactive techniques. Seeing this as very limited, they stated that abreaction as traditionally formulated, is based on an hydraulic model of the personality. According to this model, the symptoms of PTSD are believed to be a consequence of repressed emotions. The goal is therefore to facilitate free expression of these pent-up emotions by allowing the patient to re-enact the traumatic situation(s). Often the traumatic events must be "relived" a number of times in the trance and in the waking state before resolution is achieved. Brown and Fromm (1986) stated:

Although hypnotic abreaction may be of limited use in certain cases of acute stress symptoms, we do not recommend this treatment; in particular, we do not recommend that the therapist intentionally encourage dramatic emotional expression. Since PTSD is characterized by an alternation between denial and intrusion, the hypnotherapist who encouraged emotional expression is increasing the patient's risk for intrusive experiences. The patient may become overwhelmed or fear being overwhelmed and may terminate treatment prematurely. Since most PTSD patients fear loss of control, the therapist's encouragement of emotional displays merely intensifies that fear and does not facilitate working through of the trauma. In the transference, the therapist is seen as trying to re-traumatize or otherwise inflict pain on the patient. The prevalence of negative therapeutic reactions is extremely high in abreactive hypnotherapy of PTSD. (p.273)

Brown and Fromm agreed strongly with Horowitz, emphasizing that the primary treatment focus should be integration, not emotional expression.

Facilitation of conscious emotional experience (something different from emotional expression) is useful at a certain phase of the treatment, but emotional experience must be regulated so that the patient can handle the disavowed affects (...). More recent hypnotherapeutic treatment of PTSD has tended to emphasize progressive uncovering, working through, and integration, which enable the patient to gain a sense of control over the intrusive experiences while he completes cognitive processing of the trauma (...). (pp. 273-274)

With regard to the treatment of "complicated PTSD" (where structural changes have occurred in the ego), Brown and Fromm presented a specific stage-oriented treatment model, each stage having its own hypnotic and non-hypnotic methodology, underpinned by a range of different theoretical models. They distinguished the following five stages: (1) stabilization of symptoms; (2) integration, (a) controlled uncovering, (b) integrating introjects; (3) development of self; (4) drive integration; and (5) dealing with enduring biological sensitivity.
Amidst those publications which primarily emphasized integration of traumatic memories, the concept of abreaction still appeared a number of times. Thus Balson and Dempster (1980) advocated a medium-term (6-9 months) psychodynamically-oriented treatment approach for Vietnam veterans. It also included several hypnotically-induced abreactive sessions. Silver and Kelly (1985) compared modern hypnotic approaches to PTSD in Vietnam veterans used by Silver, with treatment by Kelly in 1947 of a World War II veteran using sodium amytal followed by hypnosis. About this case they wrote:

After six sessions, some with two or more repetitions of the reliving of the traumatic event, it was felt that enough "abreaction" and ventilation had occurred so that [the patient] would soon be able to accept and handle in consciousness the much revivified and worked-over material. It was then suggested that when he felt ready to handle it he would be able to recall the heretofore amnestic events, as well as what had transpired under hypnosis. (p. 223)

Kelly thus used abreaction to help integration of traumatic experiences. Silver employed a broader and more flexible therapeutic approach, utilizing hypnosis to promote relaxation and control anxiety, and less frequently to overcome resistance and memory blocks. Both authors preferred hypnosis over narcotherapy because they felt it permitted finer control over the uncovering process. In an accompanying paper, Brende (1985) summarized the literature on abreaction, concluding that Vietnam veterans are often unamenable to personality integration via abreaction alone, and require lengthy concomitant psychotherapy. Adjunctive hypnotic techniques for support, uncovering, abreaction, and integration could also be used to advantage for specific purposes during different treatment phases. Parson (1984) presented a stage-oriented treatment model of combat-related PTSD, consisting of the following phases: (1) stabilization-maintenance; (2) consolidation-stabilization; (3) in-vivo affective revival; and (4) re-integration-cohesion phase. In regard to phase (3), Parson remarked:

This phase attempts to accomplish abreactive expressions of dissociated traumatic ideas, memories, and emotions that will ultimately aid in mastery and integration of the war experience into the patient's ongoing psychic structure. (p. 43)

He added that these expressions are meaningful and effective in facilitating integration when the therapist assists the veteran to restructure the traumatic memory.

**Conclusions.** This review of the treatment of traumatic memories during the Vietnam era covers hypnosis and psychotherapy. It does not extend to behavioral approaches which have also been developing rapidly (e.g., Keane, Fairbank, Caddell et al., 1985; Scurfield, 1985). The picture emerging from both approaches (and a number of others) is that the emphasis has shifted away from abreaction of traumatic experiences, i.e., away from purely discharging pent-up traumatic emotions. While controlled re-experiencing of the trauma appears to be an essential part of almost every treatment approach, the goal has become more a facilitation of the gradual processing of all relevant aspects of the traumatic experience, and the re-integration of previously dissociated aspects of the personality. There were a few authors who, within this context, still adhered to the old concept of abreaction. Interestingly, the one author (Brende, 1985) who did so most extensively was the one most closely associated with the field of the treatment of MPD. The dissociation/integration model had thus become dominant, and those who occasionally referred to abreaction usually did so within the context of this dissociation/integration model.
It has become clearer than ever before, that the more complicated (and also the more chronic) the posttraumatic stress symptomatology is, the more complicated is the treatment required. Van der Hart, Brown, and Van der Kolk (1989) showed that already a century ago, Pierre Janet, in his treatment of posttraumatic stress, followed a stage-oriented treatment model. It consisted of: (1) stabilization and symptom reduction, (2) identification and modification of traumatic memories, and (3) re-integration and rehabilitation. Since Janet, it has been repeatedly demonstrated that in most cases of posttraumatic stress, particularly chronic disorders, treating the traumatic memories alone (whether by abreaction or by any other approach) is insufficient. It was only during the Vietnam era and its wake that well-developed stage-oriented treatment models were developed. Their common, overall goal, independent of the theoretical school, was the integration of the personality.

Conclusion

According to Peebles (1989, p. 202), "...abreaction in hypnosis is uncritically embraced, in the literature and in practice, by clinicians still unwittingly wedded to an energetic model that emphasizes the emotion-releasing or memory-uncovering aspects of abreaction, without sufficient acknowledgement of the ego and the relationship work necessary to make such abreaction safe, nor with sufficient explication of the nature or form of the "memory" likely to be uncovered. Clinicians working with MPD, although now very much aware of the latter, still continued to use the outdated conceptualization of abreaction. They clearly embrace the second model which was originally espoused by Breuer and Freud (1895), i.e., their abreaction model. During and after World Wars I and II, this model was closely followed by many clinicians, but disputed by some others. The latter tended to pursue Breuer and Freud's first model, itself a version of the French dissociation/integration model. Gradually the latter model gained the ascendant, particularly contributing to modern clinical approaches to PTSD. Modern models which emphasize integration also show how this goal is but one of several broad treatment aims, each incorporated into sequential treatments following a set of clearly delineated stages or phases, which in practice often overlap.

Treatment models for MPD are similarly stage-oriented. In regard to the traumatic memory treatment further conceptualization in terms of dissociation and integration is required. In a future paper we shall present such a model.

References
