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The Future of Mental Health Care Toward an Integrative Paradigm

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1. Introduction

The future of mental health care will be both daunting in its challenges and filled with the promise of new and better ways of understanding, preventing and treating serious mental illness. Novel approaches for assessing and treating mental illness are being shaped by advances in neuroscience, genetics and the scientific validation of ancient healing traditions in the social context of a growing range of expert resources and services that are becoming possible through rapidly increasing global access to the internet. Future models of mental health care will be determined by demographic trends and economic necessity as well as changing social norms and increasingly holistic values among both physicians and patients.

In the coming decades advances in conventional biomedicine will take in place in parallel with growing insight into the mechanisms underlying non-conventional therapies. Complementary and alternative medicine will evolve from the use of “herbs and vitamins” to a sophisticated research-driven model of integrative medicine based on individualized treatments incorporating biological, mind-body, informational and energy therapies targeting complex multi-factoral causes of mental illness. Improvements in the pharmacological management of mental illness and advances in manufacturing and quality assurance of vitamins, herbals, amino acids and other natural products will result in more efficacious and safer conventional and alternative treatment choices for psychiatric disorders. Treatment protocols incorporating validated mind-body and energy therapies will become widely used preventive therapies for maintaining optimal mental functioning in healthy populations and will be more frequently “prescribed” for the treatment of depression, anxiety, psychosis and other mental health problems.

Following a brief overview of the perspectives and limitations of biomedical psychiatry, emerging paradigms in the basic sciences and medicine that are changing the way we think about and treat mental illness are concisely described. Important recent research advances that will impact mental health care in the coming decades are summarized. Core principles and practical clinical methods of an emerging paradigm, integrative mental health care, are then discussed. In the coming decades advances in the basic sciences will transform biomedicine into a more robust and more *complete* paradigm that will reconcile modern Western scientific theory with the World’s great healing traditions. A near term benefit will be more effective person-centered mental health care. The emerging paradigm of *integrative mental health care* is an important step in this evolutionary process. The chapter concludes

with a forecast of important advances that will transform mental health care in the first decades of the 21st century.

2. Framing the problem

Conventional biomedicine – also called allopathic medicine – is based on an enormous body of research and is often very effective however conventional biomedicine has failed to adequately address medical and psychiatric illnesses in the United States and the world at large. In the U.S. 15% of the GNP (approximately \$1.6 trillion) is spent on healthcare, yet drug reactions, infections, surgical errors or other complications of conventional medical care are among the leading causes of death and morbidity (Starfield 2000; Zhan 2003). Broad economic issues that interfere with the capacity of allopathic medicine, including the specialty branch called biomedical psychiatry, to meet health care needs include restrictions of treatments covered under managed care, Medicare, and private insurance contracts, growing dissatisfaction with the quality of conventional medical care because of concerns over efficacy and safety, and the increasing cost of care for the average consumer (Astin 1998a).

The shortcomings of conventional treatments suggest that biomedicine does not fully explain the causes of mental illness while inviting rigorous consideration of novel explanatory models of symptom formation and studies on promising non-conventional treatment modalities. Growing acceptance of non-allopathic healing traditions in Western culture is the result of both scientific advances and social trends. Conventional biomedicine is being influenced by the increasing openness of Western culture to non-Western healing traditions in the context of growing demands for more meaningful and more personal contact with medical practitioners – often difficult to find during brief appointments in managed care settings. These issues have led increasing numbers of individuals who see conventionally trained physicians to seek concurrent treatment from alternative practitioners, including Chinese medical practitioners, herbalists, homeopathic physicians, energy healers and others (Barnes 2008).

Recent years have witnessed growing openness to non-conventional therapies among conventionally trained clinicians and researchers. At the same time people who are critical of Western biomedicine as currently practiced are turning increasingly to non-conventional therapies for the treatment of both medical and mental health problems (Rees 2001; Astin 1998a). Approximately 72 million U.S. adults used a non-conventional treatment in 2002, representing about one in three adults (Tindle 2005). If prayer is included in this analysis almost two thirds of adults use non-conventional therapies (Barnes & Bloom 2008). Anyone diagnosed with a psychiatric disorder is significantly more likely to use non-conventional therapies compared to the general population (Unutzer 2000; Unutzer 2002). One third of individuals who report a history of generalized anxiety, mood swings or psychotic symptoms use non-conventional approaches to treat their symptoms (Unutzer 2000). Furthermore, two thirds of severely depressed or acutely anxious individuals use both conventional and non-conventional treatments concurrently, and as many as 90% of these see a psychiatrist or other mental health professional (Kessler 2001). The findings of two large patient surveys suggest that most individuals who have mental health problems use conventional medications and non-conventional approaches at the same time (Unutzer 2000; Eisenberg 1998). According to one large physician survey approximately half of U.S. physicians believe that acupuncture, chiropractic and homeopathy rest on valid medical principles, and frequently refer patients to non-conventional practitioners for these therapies (Astin 1998b).

Mental health care in its present form is at a critical juncture. In spite of enormous industry-funded research efforts over many decades the evidence supporting pharmacologic treatments of major psychiatric disorders is inconsistent and disappointing (Sussman 2004). Billions of dollars of research spending for new drug development have failed to significantly reduce the prevalence rates of serious psychiatric disorders. In fact there is evidence that rates of some disorders are increasing in spite of ongoing advances in biomedical psychiatry. Furthermore, recently published systematic reviews of quality double-blind placebo-controlled trials fail to show strong efficacy for widely used conventional pharmacological therapies used to treat common psychiatric disorders including major depressive disorder, bipolar disorder, schizophrenia, dementia, and others (Moller 2007; Kirsch 2008; Thase 2008; Fournier et al 2010; Fountoulakis 2008; Katzman 2009; Dixon et al 2009; Tajima et al 2009; Birks 2006) In addition to growing concerns about their lack of efficacy psychopharmacologic treatments are plagued by serious safety issues. Many widely used psychotropic drugs are associated with serious adverse effects including weight gain and increased risk of diabetes and heart disease, neurologic disorders, and sudden cardiac death, and increased suicide risk. Furthermore conventional drugs often result in partial response or no response even when recommended treatment protocols are followed. The persistence of serious symptoms of mental illness during treatment results in impairments in occupational functioning with associated losses in productivity. Concerns about the limitations of contemporary biomedical psychiatry including inequalities in delivery of mental health services, the lack of integration of mental health services into other medical specialties, conflicts of interest in relationships with the pharmaceutical industry and other clinical practice issues have been raised by leading figures in academic psychiatry (Reynolds et al 2009).

In response to the limitations of conventional mental health care future directions of research and clinical therapeutics are becoming progressively more open to the rigorous examination of novel perspectives. This growing intellectual openness is giving birth to a truly *integrative* model of mental health care that draws from the best evidence in both conventional biomedical psychiatry and alternative modalities. Novel theories are being advanced in response to the conceptual and practical clinical limitations of the orthodox view embraced by conventional biomedical psychiatry in efforts to more adequately explain both normal conscious functioning and the complex factors that contribute to mental illness. These emerging theories will shape the future of mental health care. They are at the heart of a rapidly evolving paradigm called “integrative mental health care” that is leading to innovative new research methods and more effective clinical therapeutics. At the level of individual patients an important result of this evolutionary process will be *more effective* and *more compassionate* “whole person” mental health care that takes into account the complex biological, psychological, social, cultural and possibly also *spiritual* causes and meanings of mental illness.

3. Biomedicine and biomedical psychiatry in overview

At its core, biomedicine or “allopathic” medicine incorporates assumptions about the nature of material existence and identifiable causal relationships between factors in the environment and illness phenomena that can be traced to cultural and philosophical roots of early Western civilization. This ancient philosophical perspective eventually led to the establishment of formal methods of observation and measurement, culminating in modern scientific method. In spite of the recent confirmation of a role of quantum mechanics in

complex living systems including the human brain, biomedicine continues to rely exclusively on the tenets of classical Newtonian physics in building its theories and evaluating claims of mechanism and demonstrations of outcomes in its clinical methods. In short, the dominant paradigm of contemporary biomedicine – and by extension biomedical psychiatry – rests on metaphysical assumptions about the properties of phenomena that can have existence according to the classical materialist world-view of the universe – a model that was replaced over a century ago by a more inclusive paradigm informed by quantum mechanics and general relativity theory.

Contemporary biomedical psychiatry – the orthodox perspective in which mental health care is practiced – is based on the assumption that mind is a manifestation of what the brain does. Diverse perspectives on the so-called “mind-body” problem exist in contemporary psychiatry however there is still no consensus on a sufficient explanatory model of mind-body interactions (Kendler 2001; Wright & Potter 2003). Complete understanding of mind-body interactions will probably require a convergence of classical and non-classical paradigms (Shang 2001). For example, light exposure therapy is known to have therapeutic effects on melatonin and neurotransmitter activity and may also interact with brain dynamics on subtle levels possibly consistent with the postulates of quantum mechanics or quantum brain dynamics (Curtis 2004). The human bio-field is probably best described with respect to complex interactions between classical and non-classical kinds of energy and information, including electrical, magnetic, acoustic, and large-scale quantum properties of living systems (Rein 2004). Practitioners of conventional biomedicine frequently regard “energy” treatments as examples of the placebo effect because of the assumption that postulated forms of energy or information on which energy treatments rest simply do not exist. Rigorous research designs investigating “energy” medicine are difficult to achieve and findings on the effectiveness of directed intention and putative non-classical energy effects on human health remain inconclusive (Abbott 2000). Nevertheless, accumulating research evidence shows that beneficial effects of some energy treatments can be replicated under controlled conditions, suggesting that non-classical forms of energy or information influence outcomes in some cases.

The reductionist perspective implicit in Western science informs the central dogma of biomedical psychiatry, namely neurotransmitter theory, which holds that discrete correspondences exist between symptoms of mental illness and *deficiencies* or *dysfunction* at the level of specific neurotransmitters (Lopez-Munoz 2009). To date the neurotransmitter theory has failed to provide an adequate explanatory model of the causes of mental illness or to consistently predict responses to treatments targeting specific neurotransmitters (Lopez-Munoz 2009). In addition to problems related to the questionable validity of core assumptions on which biomedical psychiatry is based, the orthodox paradigm is limited by numerous practical issues. Biomedical psychiatry prioritizes pharmacological and psychotherapeutic treatment of acute symptoms of serious chronic mental illnesses over prevention and maintaining wellness. While pharmacological treatments often result in rapid, dramatic stabilization of severe symptoms, many so-called *maintenance* therapies of common psychiatric disorders have marginal efficacy compared to placebos (Sussman 2004). Furthermore, significant unresolved safety issues and the high cost of many psychotropic drugs significantly limit the potential reach of biomedical psychiatry in Western culture and render them inaccessible and often irrelevant in less developed world regions. On a practical vein mental health care as practiced in North America, and the EU is typically limited to brief impersonal appointments emphasizing “medication management” under cost

constraints of “managed care” that fail to take into account the complex medical, psychosocial, cultural or spiritual factors that frequently contribute to mental illness.

4. Biomedical psychiatry is an evolving paradigm

Recent discoveries in neuroscience and genetics suggest that contemporary models of human consciousness and, by extension, understandings of mental illness are incomplete. Theories describing neurochemical mechanisms underlying normal brain functioning continue to evolve at a rapid rate pointing to the limitations of the neurotransmitter theory. This still-current model advanced in the early 1960s characterizes neurotransmitters as substances that are invariably synthesized and released by neurons, act on post-synaptic receptors, and mediate both normal and abnormal states of consciousness in relationship to specific activity levels or dysregulations at the level of their synthesis or receptor binding affinities. In contrast to the above model in which dysregulations of specific neurotransmitters correspond to discrete symptoms, certain recently characterized neurotransmitters and neuropeptides are not stored in synaptic vesicles or released by exocytosis and do not act at receptor sites on post-synaptic vesicles, thus they do not fulfill criteria for neurotransmitters. D-serine is an example of such “atypical” neurotransmitters. This molecule is synthesized and stored in neuroglia and binds to NMDA receptors whose dysregulation has been implicated in the pathogenesis of schizophrenia and other psychotic disorders. Other “atypical” neurotransmitters that may play significant roles in psychiatric disorders include nitric oxide, carbon monoxide, and possibly hydrogen sulfide. It has been suggested that nitric oxide (NO) may play an important role in learning and memory. (Snyder 2000).

When mental health care is most effective it addresses symptoms of mental illness at their root psychological, social, cultural, biological and spiritual causes. The contemporary biomedical model of mental health care is limited in its capacity to alleviate the root causes of suffering because its theoretical foundations and clinical methods address only some of the complex causes and meanings of mental illness. This is largely due to the fact that the root causes of mental illness are still poorly understood resulting in numerous poorly substantiated models of mental illness causation and a corresponding multiplicity of therapies that do not adequately address or correct the root psychological, cultural or spiritual meanings or biological causes of symptoms (Wright & Potter 2003). At a basic theoretical level the causes of symptom formation in psychiatric illness are poorly understood because of the absence of research methods needed to examine and elucidate the roles of disparate external and internal factors that cause or exacerbate cognitive, affective or behavioral symptoms. This has led to multiple biological and psychodynamic theories whose premises are often contradictory or mutually exclusive. In the broader context of the history of medicine it is not surprising to find that psychiatry lacks a unifying body of theory or universally endorsed standards of clinical practice. Factors contributing to the ambiguous position of psychiatry have been discussed at length in two important works (Grof 1985; Wilber 2001) Among psychiatrists, the dominant view is an extension of contemporary biomedicine, which equates mental health problems to discrete functional abnormalities at the level of neurotransmitters. According to this model, successful “treatment” entails “correcting” a presumed neurochemical abnormality with the goal of restoring to normal a corresponding dysregulation in cognitive, emotional, or behavioral functioning. While psychiatrists often use cognitive-behavioral approaches or “talk” therapies directed at changing maladaptive interpersonal dynamics, depth psychological

approaches examining existential or spiritual themes are typically regarded as incidental to “more serious” psychotherapeutic or pharmacological treatments informed by the dominant biomedical paradigm. Agreeing on a “most relevant” theory or a “most appropriate” treatment is even more problematic for psychologists for whom numerous theories of symptom formation have yielded disparate and frequently contradictory explanations of the underlying causes or meanings of psychopathology. Because of the multiplicity of theories and clinical practices that comprise contemporary psychology and psychiatry there is no theory-neutral method for evaluating the relative merits and weaknesses of disparate treatments. Subsequently consensus is lacking on the “most appropriate” or “best” conceptual framework or practical clinical methods when approaching a specific mental health problem. In addressing this dilemma Wilber has systematically reviewed divergent psychological theories of mind-body, and has proposed guidelines for the creation of an “integral psychology” that takes into account core psychological and spiritual features of many dominant theories of mind-body (Wilber 2001). An important practical goal of this work is the elaboration of a series of integrative psychotherapeutic strategies that are ideally suited for specific symptoms of mind-body, psychological or spiritual distress.

In a more practical vein contemporary biomedical psychiatry is constrained by ambiguous research evidence supporting its various theoretical claims. This stands in contrast to biomedicine in general, in which discrete unambiguous relationships have been confirmed to take place between identifiable disease-causing factors and discrete disorders. Novel assessment and treatment approaches in biomedical psychiatry will emerge from on-going advances in the basic neurosciences, brain imaging, immunology and genetics. Future models of mental illness causation will not depend exclusively on empirical verification of strictly biological processes and will postulate both classically described kinds of biological and biophysical causes (eg, genetic factors and neurotransmitter dysregulation) as well as non-classical kinds of phenomena (eg, non-linear brain dynamics and quantum-level processes). Future studies will use advanced functional imaging technologies to examine the role of complex non-linear dynamic relationships between neural circuits and the immune system and specific psychiatric disorders, as well as the postulated role of quantum “entanglement” associated with large-scale coherent macroscopic quantum field effects in both normal consciousness functioning and psychiatric symptom formation.

5. Important advances are taking place in the theory and practice of psychiatry

In contrast to the limitations of the clinical practice of biomedical psychiatry steady advances in medical research are contributing to a more robust paradigm of mental health care that will translate into improvements in patient care in the coming decades. On-going advances in the neurosciences, psychopharmacology and brain imaging research will soon yield novel assessment approaches, more effective and safer conventional treatments including drugs based on novel mechanisms of action and new therapeutic uses of light, weak electrical current and magnetic fields. Collectively, these advances are transforming the theoretical foundations and clinical therapeutics of contemporary Western mental health care. Novel theories in biomedical psychiatry promise significant advances in understanding of the nature and causes of mental illness. For example, it has been suggested that non-linear dynamics (ie chaos theory) may help explain mood changes associated with the menstrual cycle on the basis of postulated complex influences of hormones and

neurotransmitters, as well as social and psychological variables on mood (Rasgon 2003). Substantiation of this model by research findings may eventually lead to effective preventive strategies addressing hormone-mediated mood disturbances. There is significant emerging evidence that complex interactions between immune functioning, neurotransmitters and hormones are important in depressed mood, anxiety, and other disorders (Miller 2004).

Improved understanding of genetic factors that mediate mental illness will continue to accrue from analysis of the genetic library available in the Human Genome Project. Biomedical psychiatric research is increasingly taking into account the significance of genetic and biochemical variability in mental illness. For example, the high degree of individual variability in response to conventional drugs suggests poorly characterized differences in neurotransmitter deficiencies or imbalances associated with major depressive disorder, generalized anxiety and other psychiatric disorders (Delgado 2000). Studies on the effects of neurotransmitter depletion on mood are consistent with the view that changes in brain serotonin or norepinephrine activity levels *alone* do not fully explain the causes of depressed mood or observed differential responses to antidepressants which are probably related to complex biological and social factors including genetic variability (and thus ethnicity), diet, and culturally determined expectations. Genetic, cultural and social variability translates into differences in effective dosing strategies using conventional drugs and commensurate differences in susceptibility to adverse effects (Lin 2004). The high degree of biological variability may be especially problematic for patients of African or Asian ethnicity potentially causing safety issues or poor outcomes (Lawson 2004; Edmond 2004). The AmpliChip CYP450™ test, recently introduced by Roche Pharmaceuticals, incorporates two DNA amplification and detection technologies that screen for genetic mutations. The polymerase chain reaction (PCR) is used to amplify or make copies of genetic material, and a high-density microarray technology is subsequently used to capture and scan the amplified DNA. The device will enable physicians to determine when variations or mutations are present in the CYP450 cytochrome system providing clinically relevant information about individual differences in prescription drug metabolism. In the near future psychiatrists will routinely order outpatient laboratory studies using this technology to determine the most appropriate drugs and doses to use for a given patient while minimizing the risk of adverse effects (Amanda, Meyers and Nemeroff 2010).

In biomedical psychiatry classically established forms of energy are used as probes to provide information about brain activity associated with symptoms. Normal brain functioning is characterized by complex bio-magnetic and electrical activity that can be measured using functional brain imaging techniques including positron emission tomography (PET), single photon emission computed tomography (SPECT), functional magnetic resonance imaging (fMRI), magneto-electroencephalography (MEEG) and quantitative electroencephalography (QEEG). Advances taking place in functional brain imaging will permit studies on discrete neurotransmitter/receptor systems underlying normal conscious functioning as well neural and molecular processes involved in the pathogenesis of specific psychiatric disorders. This will result in improved diagnostic accuracy of neurologic and psychiatric disorders with commensurate improvements in the efficacy of treatments targeting discrete neurotransmitter systems and neural circuits (Bandettini 2009). Emerging evidence suggests that consistent relationships exist between specific patterns of electrical brain activity and discrete psychiatric disorders (John 2007; Bares 2007; Venneman 2006; Brinkmeyer 2004) however it is often difficult to determine

whether energetic “abnormalities” in the CNS are causes or effects of pathology. Electrical currents and pulsed electromagnetic fields are established conventional treatments in contemporary biomedical psychiatry. Electrical current and focused magnetic fields probably have real-time effects on the biomagnetic properties of brain functioning in addition to long-term effects at the level of neurochemical and biomagnetic changes in the activity of brain circuits associated with the regulation of affect, cognition and behavior (Liboff 2004).

Important technological innovations that will become more widely used treatments of mental illness in the first half of the 21st century include transcranial magnetic stimulation (TMS), EEG biofeedback and virtual reality exposure therapy (VRGET). Biofeedback techniques addressed at modifying autonomic activity include galvanic skin resistance (GSR), electromyography (EMG), and electroencephalography (EEG) training techniques are widely used in outpatient clinic settings to treat phobias and other anxiety disorders. Emerging findings suggest that biofeedback training based on heart rate variability (HRV) significantly reduces stress and improves general feelings of emotional well-being in individuals who are subjected to acute job-related stress (McCraty 2001). Continued rapid growth in broad-band internet access will soon result in widespread use of these biofeedback techniques by patients at home and at work environments using portable devices based on existing computer technology. Chronically anxious patients, and especially those with panic disorder or agoraphobia, are frequently too impaired by their symptoms to seek professional care. Others are geographically isolated and cannot obtain conventional cognitive-behavioral therapy (CBT) or pharmacological treatment for severe anxiety syndromes. Broad-band videoconferencing using internet technology is being explored as a cost-effective alternative mode of treatment delivery to these home-bound patients. It has been established that an effective therapeutic alliance can be achieved between therapist and patient when CBT is done by videoconference (Manchanda 1998; Bouchard 2000). Although CBT can be done by telephone (telepsychiatry), videoconferencing has the advantage of permitting the therapist to demonstrate behavioral exercises to the patient, and both therapist and patient are able to accurately observe non-verbal behaviors during sessions creating an authentic sense of “presence” that simulates face-to-face interactions in conventional psychotherapy settings. A large controlled study showed that CBT is equally effective for a range of anxiety symptoms when done in conventional out-patient therapy settings or via broad-band videoconferencing (Day 2002). CBT delivered via videoconferencing is as effective as face-to-face CBT in patients with both panic disorder and agoraphobia (Bouchard 2004). This is a significant finding in that it provides a viable and affordable alternative to routine CBT for this severely impaired population who might otherwise not utilize mental health services. In the coming decades advances in artificial intelligence will lead to the creation of therapist “avatars” that will interact with patients in virtual environments, will be capable of optimizing psychotherapeutic interventions in response to each unique patient’s needs, and will be capable of simulating both expert factual knowledge and therapeutic interventions.

Controlled studies confirm that virtual reality graded exposure therapy (VRGET) (sometimes called *experiential cognitive therapy* or “ECT” in European countries) is more effective than conventional imaginal exposure therapy (using mental imagery to provoke the feared object or situation), and is comparable to in vivo exposure therapy (Pertaub 2001; Emmelkamp 2001). Many VRGET tools are already available over the internet, permitting mental health professionals to guide patients in the use of these computer-based advanced

exposure protocols through real-time videoconferencing anywhere high-speed internet access is available (Botella 2000). Within the next few decades treatments of phobias, panic attacks, and other severe anxiety disorders will combine VRGET with biofeedback, cognitive-behavioral therapy (CBT) or mind-body practices in outpatient settings or in the patient's home via real-time interactions permitting authentic "presence" between the patient and the therapist or a therapist "avatar" via broadband internet connections. Research progress in all of these technology-based therapies will soon yield effective, safe non-pharmacological treatments for major depressive disorder, bipolar disorder, anxiety disorders and other serious psychiatric disorders.

Brain-computer interface (BCI) is a frontier technology that is emerging from the new field of neural engineering that will soon enable paralyzed individuals to regain use of their limbs. This technology permits direct communication between brain centers that control movement and robotized prosthetic devices. In the coming decades continued evolution of this technology will lead to neuroprosthetic devices that will permit individuals diagnosed with psychiatric disorders to regulate behaviors, mood or cognitive problems to enhance functioning in all of these areas (Krusianski 2011). By the year 2050 non-invasive neuroprosthetic devices will be widely used to effectively and safely treat serious psychiatric disorders that are poorly responsive to psychotropic drugs including bipolar disorder, severe depressed mood and dementia.

In addition to advances in psychopharmacology, genetics and technology-based therapies, natural product research is yielding significant findings of beneficial effects when a specific vitamin, mineral or herbal is used as a monotherapy to treat a specific psychiatric disorder (Sarris et al., 2009). An important trend that is pushing the evolution of contemporary biomedical psychiatry toward increasing integration with other healing traditions comes from the use of synergistic combinations of synthetic drugs and select natural products (Sarris et al., 2009). This principle has been demonstrated in many studies showing increased antidepressant efficacy when SAMe, folic acid, L-tryptophan or omega-3 fatty acids are combined with antidepressants in the treatment of depressed patients. (Sarris et al., 2009); and increased efficacy when n-acetyl cysteine, magnesium, folic acid or amino acids are combined with conventional mood stabilizers in bipolar patients (Sarris et al., 2010b). Future studies will examine such synergistic combinations of synthetic drugs and natural products to determine optimal formulas addressing common psychiatric disorders. The use of natural products including nutrients or botanicals in combination with pharmacotherapeutic agents holds the potential for improving outcomes while reducing adverse effects by permitting reductions in effective doses of psychotropics and commensurate reduction of adverse effect risks.

6. Novel paradigms are shaping the future of medicine and mental health care

In conventional biomedicine, mainstream concepts from chemistry and biology provide the theoretical foundations for current explanatory models of illness phenomena. Conventional biomedicine posits that health and illness can be adequately characterized in terms of established theories in biology and physics. Some novel approaches in medicine and psychiatry do not radically depart from assumptions embedded in the orthodox views of conventional biomedicine. For example psychoneuroimmunology (PNI) is a synthetic model that starts from established theories in psychiatry and biomedicine and postulates complex

dynamic relationships between stress, immunological status and psychiatric or neurological symptom formation (Irwin 2008; Muller & Schwarz 2007; Muller & Schwarz 2006). There is a rich discussion of PNI and other emerging paradigms in the peer-reviewed journal literature including emerging models in physics, biology and information science describing structure-function relationships in complex living systems. However, in general the day to day clinical practice of biomedicine takes place without regard to these novel ideas. Non-classical paradigms including complexity theory and quantum field theory (QFT) may eventually lead to novel research methodologies that will elucidate subtle inter-relationships between “healing intention,” immune status and psychiatric symptom formation. Phenomena regarded as legitimate subjects of inquiry in non-Western healing traditions have been largely ignored in biomedical research including, for example, the role of prayer and intention in health and healing; and putative beneficial effects of so-called “subtle energy” on immunological or neurobiological functioning as postulated by practitioners of QiGong, “healing touch” or other forms of “energy medicine.”

Although many non-allopathic therapies meet conventional scientific criteria for efficacy and effectiveness they have not been endorsed as mainstream treatments largely because of entrenched conservative beliefs in Western medicine and strong academic biases against novel ways of understanding illness. Non-allopathic treatments based on biological mechanisms of action have been more thoroughly investigated in controlled studies compared to mind-body or “energy” therapies. St. John’s Wort (*Hypericum perforatum*), SAMe, 5-HTP and folic acid are examples of non-conventional biological modalities that have been thoroughly evaluated. Mind-body therapies and treatments based on established or postulated forms of energy or information have not yet been carefully evaluated in Western-style research studies. For example, Reiki, qigong, and homeopathy are based on postulated forms of energy or information that have not been verified and may in fact not be potentially verifiable by Western science. While some non-allopathic therapies are probably no more effective than placebos, the same argument can be applied to conventional biomedical treatments. The placebo effect is widely accepted among conventional Western medical practitioners as playing a significant treatment role in both medical and mental health problems (Dixon 2000). Meta-analyses of controlled trials suggest that conventional drugs used to treat major depression and other psychiatric disorders are no more effective than placebos (Kirsch 2002; Thase 2002; Sussman 2004). Unanswered questions about the role of placebo effects in treatment response are shared concerns for both conventionally trained and alternative medical practitioners. The controversy over placebo effects is complicated by the more recently described “nocebo” effects—adverse effects associated with placebos—which may affect as many as 40% of individuals who take placebos (Tangrea 1994). These findings suggest that many treatments probably have non-specific effects that are either beneficial or detrimental to health, including general effects on the body’s immune, endocrinologic, and central nervous system. There is no agreed on theory that fully explains placebo and nocebo effects however personal, social and cultural factors that are difficult to quantify may facilitate “self-healing” when patients undergo any kind of medical or psychiatric treatment.

Disparate systems of medicine postulate the existence and involvement of different forms of energy and information in health, illness and healing. Some assessment approaches rely on the accurate characterization of classically described biological, energetic or informational processes that constitute the presumed causes of a particular symptom or symptom pattern. A more complete and accurate understanding of the role of consciousness in health and

healing may require a convergence of biomedicine and non-biomedical paradigms. Some non-allopathic treatment approaches are based on classical forms of energy including electromagnetic energy and sound. Examples include Western herbal medicine, functional medicine, EEG biofeedback, music and patterned binaural sounds, full spectrum bright light exposure, micro-current brain stimulation, and dim light exposure at selected narrow wavelengths. It has been established for decades that all living organisms emit ultra-weak photons and under certain conditions such biophotons are emitted as highly ordered or "coherent" light (Bajpai 2003; Popp 2003). Research on biophoton emissions from the human body have led to speculation about "light channels" that regulate energy and information transfer within the body, biological rhythms associated with the intensity and patterns of biophoton emissions, and diseases related to energetic "asymmetries" between the left and right sides of the body (Cohen 2003; Wijk 2005). Studies on biophoton emissions associated with acupoints suggest that subtle differences in count, wavelength and coherence may correspond to energetic "imbalances" in yin and yang elements that, according to Chinese medical theory, are associated with neurologic and psychiatric disorders (Yang 2004).

Treatment approaches based on classically accepted forms of energy can have both direct energetic effects and indirect informational effects on biological or energetic processes associated with health and illnesses. The latter can be described as "informational" effects of classical forms of energy. In contrast treatments based on postulated non-classical models of energy or information, including quantum mechanics, quantum information, and quantum field theory may have both direct and subtle effects on brain functioning and physiology (Curtis 2004; Hankey 2004). Functional medicine is an important emerging paradigm that views health and illness in relationship to informational changes in complex intercellular communication processes. Functional medicine rests on conventional biomedical understandings of pathophysiology in the context of assumptions of biochemical and genetic individuality (Bland 1999). According to this model health and illness result from interactions between the unique genetic constitution of each individual and many different internal and external factors including infection, trauma, lifestyle, diet or environmental influences that can modify genetic expression and alter intercellular communication manifesting as complex physical or psychiatric symptom patterns. Disparate molecules serve as cellular mediators, including neuropeptides, steroids, inflammatory mediators and neurotransmitters. Functional assessment approaches identify informational changes in intercellular communication associated with symptoms, and effective treatments modify the informational basis of illness taking into account complex interactions between mediators and different cell types. Preliminary findings suggest that immunological dysregulation plays a significant causative role in the pathogenesis of affective disorders, schizophrenia, Alzheimer disease, and other degenerative neurological disorders (Sperner-Untewegger 2005). The relationship between immunity and mental illness is complex and poorly understood and the same immunological dysregulation is sometimes found in patients with disparate symptoms (Irwin 2008). Recent studies suggest that nonspecific over-activation of the immune system involving T-helper cells takes place in subgroups of persons with schizophrenia (Strous & Shoenfeld 2006). The immune-mediated dysregulation of both dopamine and glutamate neurotransmission has also been implicated in the pathogenesis of schizophrenia (Muller & Schwarz 2006). In response to these findings, anti-inflammatory and immune-modulating therapies are being investigated as future treatments for affective disorders and schizophrenia. Horrobin (Horrobin 1996; Horrobin 1998) proposed a "membrane phospholipid" model of schizophrenia which posits that abnormal metabolism

of phospholipids resulting from genetic and environmental factors manifests as a chronic, severe constellation of symptoms typically diagnosed as a variant of schizophrenia or schizoaffective disorder. The membrane phospholipid hypothesis posits that a spectrum of psychiatric disorders is associated with abnormalities in neuronal membranes and the type and severity of symptoms are functions of the magnitude and specific type of metabolic errors resulting in abnormal phospholipid metabolism.

Some established and emerging non-allopathic assessment approaches postulate that illness phenomena can be more completely described in terms of non-classical forms of energy. Examples include analysis of the vascular autonomic signal (VAS) (Ackerman 2001), Chinese meridian diagnosis (Hammer 2001; Zhang 2002; Langevin et al 2004), homeopathic constitutional assessment, and Gas Discharge Visualization (GDV) (Korotkov, Williams and Wisneski 2004). Because disparate factors contribute to mental illness it is often difficult to accurately and reliably assess the causes of symptoms and to identify the most efficacious treatments. The integrative mental health care of the future will include sophisticated assessment approaches capable of evaluating the causes of mental illness at biological, informational and “energetic” levels of body-brain-mind. On-going research studies of non-allopathic assessment approaches will validate some as clinically useful in mental health care while others will become marginalized. The increasing use of novel assessment approaches in clinical psychiatry will gradually lead to more comprehensive and more cost-effective treatment planning. Promising emerging approaches in psychiatric assessment include:

- Testing of the urine and blood to reveal dysregulation at the level of neurotransmitters and immune factors associated with mental illness
- Quantitative electroencephalography (QEEG) to quantify differences in brain electrical activity for clarifying psychiatric diagnosis and predicting treatment response
- The use of micro-array “chips” to analyze genetic differences in drug metabolism associated with individual differences in the P450 cytochrome system
- The use of advanced semiconductor devices to measure ultra-weak biophotons providing clinically useful indicators of the causes of mental illness at subtle neurochemical and “energetic” levels of brain function
- The use of pulse diagnosis as used in Chinese medicine, Ayurveda, and Tibetan medicine and scientific studies to validate energy assessment in the context of novel paradigms in physics including quantum mechanics

Like emerging assessment approaches many non-allopathic treatment approaches are also based on postulated non-classical forms of energy or information including for example acupuncture, homeopathic remedies, Healing Touch, Qigong and Reiki. In Chinese medicine “Qi” is regarded as an elemental energy that cannot be adequately described in the language of contemporary science, but may have dynamic attributes that are consistent with quantum field theory (Chen 2004). Quantum brain dynamics (QBD) is an example of a non-classical model which invokes quantum field theory to explain certain dynamic characteristics of brain functioning, including possibly the influences of non-classical forms of energy or information on mental health. It has been suggested that healing intention operates through non-local “subtle” energetic interactions between the consciousness of the medical practitioner, and the physical body or consciousness of the patient (Zahourek 2004). In contrast, energy psychology assumes that highly developed energetic techniques, including acupuncture, acupressure and healing touch, are required to affect energetic balance and health. “Mind energetics” is a recently introduced conceptual model that postulates the exchange of “energy” through language and intention during therapeutic

encounters, and claims that “energy” transforms psychological defenses in beneficial ways (Pressman 2004). Widespread interest in the role of spirituality and religion in mental health has resulted in increasing research in this area and the inclusion of a special V code in the DSM-IV for religious or spiritual problems (Turner 1996).

7. Complex systems theory will expand the paradigm of biomedical psychiatry

Contemporary biomedical theory argues that medical or psychiatric disorders are attributable to discrete “causes” that are biological in nature and take place at the level of interactions between molecules or cells. An implicit assumption underlying this reductionist view is that for any *disorder* a particular biological marker corresponds to an underlying “cause” in a simple linear fashion. A corollary of this view is that a treatment is “effective” when it adequately addresses and ultimately “corrects” the discrete underlying biological cause of a specific (medical or psychiatric) symptom or disorder by repairing abnormal functioning at a cellular or molecular level. This is in fact the basic logic supporting the neurotransmitter theory as an explanatory model in biomedical psychiatry (see above). The complex systems model stands in contrast to the conventional view of linear causality that is implicit in biomedical theory (Auyang 1998; Bell 2002). Biomedicine is beginning to incorporate concepts from emerging theories in physics, biology, and information science describing structure-function relationships in complex living systems including the human brain. Complex systems theory invites an increasingly integrative perspective in the social sciences, biology and medicine. Important advances will take place in the conceptual foundations of biomedical psychiatry when the research dialog includes complex systems theory, which argues that dynamic non-linear energetic or informational states at multiple levels in the brain and body manifest as symptoms (Morowitz & Singer 1995). This view implies that although a particular symptom may have one apparent “primary” or discrete cause, complex dynamic cause(s) can vary significantly between individuals reporting similar symptoms as a consequence of each person’s unique biochemical, genetic, social, psychological, and energetic makeup. For example, light exposure therapy is known to have therapeutic effects on melatonin and neurotransmitter activity that result in improved mood – but emerging research evidence suggests that light interacts with brain dynamics on subtle energetic levels consistent with the predictions of quantum mechanics. In contrast to the orthodox view of empiricism and linear causality many traditional healing systems conceptualize illness, health, and healing in terms of subtle non-linear processes at multiple hierarchic levels of body-mind-spirit within each unique human and between humans and their environments.

In the framework of complex systems theory, a symptom or symptom pattern (ie, a “disorder”) is viewed as an emergent property of multiple factors interacting at multiple hierarchical levels. Practical differences in assessment and treatment approaches in the world’s healing traditions can be viewed as reflecting basic differences in assumptions underlying contemporary biomedicine and complex systems theory. Biomedicine assumes that linear causality operates in the dynamic interactions between natural phenomena and, by extension, discrete causal relationships exist between identifiable causal factors and disease states in a system that can be adequately characterized using existing empirical research methods. In contrast to the linear view, the complex systems model posits that dynamic non-linear relationships exist between multiple factors in a hierarchical web and

dynamic emergent properties of body-brain-mind experienced as physical or mental symptoms (Strogatz 2001). In some cases, for example in the management of infectious diseases, discrete symptoms are correlated with an identifiable viral or bacterial infection, and the linear biomedical model probably yields a relatively accurate description of symptom formation, and is therefore an adequate basis for effective treatment planning. However in mental illness, causes, conditions or meanings associated with a symptom pattern are typically more complex and change over time. Even in cases where conventional biomedical assessment yields clinically useful information, it is reasonable to approach assessment of multiple interacting factors associated with mental illness within the framework of complex systems theory and to regard discrete biological markers (eg, thyroid hormone levels, electrolytes, immune factors) as important elements of a complex dynamic web of factors associated with mental illness.

Conventional biomedicine tacitly acknowledges the validity of the complex systems model by employing pharmacological or other kinds of biological treatments targeting disparate metabolic or cellular functions when addressing a particular disorder. The same logic supports the use of integrative approaches using modalities that combine to yield synergistic effects when addressing disparate causal factors underlying psychiatric disorders. Although a particular symptom pattern may have one or few primary causes, each patient's unique biochemical, genetic, social, psychological, and possibly also energetic or spiritual constitution translates into unique differences at all of these levels in individuals diagnosed with the same psychiatric disorder. The situation becomes even more complex when taking into account that in any individual the psychological, biological, energetic, informational and possibly spiritual causes of a disorder may fluctuate over time in relation to both dynamic internal and environmental factors. Conventional biomedical psychiatry argues that persisting cognitive, affective and behavioral symptoms in the same individual are associated with varying levels of activity in neurotransmitters and receptors—or dysfunction at either level—over time however reasons for such variability remain unclear. It follows from this observation that an assessment or treatment approach that is appropriate for a particular psychiatric disorder at one time for a particular patient may not be the most appropriate approach with respect to another individual diagnosed with the same disorder, or even the same individual diagnosed with the same disorder at a future time. Because complex systems theory does not inform contemporary biomedical psychiatry clinical methods used in assessment and treatment planning do not take into account the complex and highly variable nature of factors associated mental illness at the level of each unique patient. Starting from complex systems theory and assuming that dynamic symptom patterns that comprise psychiatric disorders are associated with multiple factors and multiple *kinds* of factors that change over time, it is reasonable to assume that using two or more assessment approaches will more adequately *capture* multiple causes as well as different kinds of causes. It follows from the complex systems model that the most appropriate and effective treatment plan will include disparate modalities targeting disparate causal factors identified through history or formal assessment. Different approaches are being used to model complex variables that operate in non-conventional healing approaches including path analysis and the analysis of latent variables (Schuck 1997; McArcle 2009). The latter approach has been used to assess quality of life in psychotic patients (Mercier 1994).

8. Emerging understandings of “energy” and information will contribute to future mental health care

Some “alternative” treatments not currently endorsed by biomedical psychiatry are based on well described forms of energy such as electromagnetism and sound. Examples include EEG biofeedback, music and patterned binaural sounds, full spectrum bright light exposure, micro-current brain stimulation, and high-density negative ions. Treatment approaches based on such classically described forms of energy and information have specific or general beneficial effects at the level of neurotransmitter systems or brain circuits. In contrast, treatments based on postulated non-classical kinds of energy or information, including quantum mechanics and quantum field theory, may have both direct and subtle effects on brain function and mental health. Non-conventional modalities based on concepts that are presently outside of the tenets of biomedicine include acupuncture, homeopathic remedies, Healing Touch, qigong, and Reiki. Ancient healing traditions and accumulating modern research evidence suggest that prayer and other forms of directed intention may help alleviate symptoms of physical and mental illness. This is the domain of energy medicine (Chen 2004).

In contrast to the materialist philosophy implicit in contemporary biomedicine and by extension biomedical psychiatry, Indo-Asian philosophy is based on the premise that the nature of reality, including both inanimate matter and living systems, is best understood in terms of fundamental properties of a postulated “vital energy” (Di Stefano, 2006). The meaning and role of causality in non-Western systems of medicine is not constrained by physical processes interacting in a world ordered by linear time flow. According to this view states of both living and non-living systems are regarded as secondary manifestations of more primary energetic states. By extension “energetic” factors are believed to play important roles in the manifestations of all living systems including changes in functioning associated with illness and health. Although “Qi” in Chinese medicine and “Prana” in Ayurveda cannot be directly observed or measured using Western style research methods professional practitioners of Chinese Medicine and Ayurveda can infer the roles of specific energetic “imbalances” when particular illness phenomena are present. Because of the philosophical difference between the Western medical tradition and Indo-Asian medicine proponents of contemporary biomedicine often regard methods used in non-Western systems of medicine as subjective or arbitrary. By the same token, non-Western healing traditions often place little emphasis on the empirical methods of Western science that attempt to “reduce” subjective symptoms into mechanistic descriptions of discrete underlying biological “causes.” Indeed, from the perspectives of traditional Chinese medicine (TCM) and Ayurveda, attempts to empirically verify relationships between energetic phenomena are regarded as unnecessary because a fundamental energetic principle is assumed to be immanent throughout the universe.

Novel understandings of energy and information are also coming from recent theoretical developments in quantum physics. A fundamentally new direction in our understanding of consciousness and by extension the causes of mental illness – will come from an emerging theory that regards brain functioning from the perspective of quantum mechanics and quantum field theory (Naeqau & Kafatos 1999; Elitzur 2005; Lorimer 2004). Quantum brain dynamics attempts to explain subtle characteristics of brain functioning in terms of non-classical forms of energy and information (Jibu and Senta 2001). Pending further confirmation through advanced functional brain imaging studies quantum brain dynamics

may eventually help explain reports of therapeutic benefits achieved through non-local interactions between the consciousness of the medical practitioner and the patient (Schlitz & Braud 1997; Astin 2000; Standish 2001; Wackerman 2003; Standish 2003). This work will eventually yield a testable hypothesis about the role of prayer and intention in health and healing clarifying therapeutic mechanisms associated with spiritual and mind-body practices including meditation, yoga and energy medicine.

9. Possible future pathways of medicine and psychiatry and a forecast

Within the first decades of the 21st century psychiatrists will embrace assessment and treatment approaches now excluded by orthodox Western medicine. Novel diagnostic and treatment modalities will emerge in the context of on-going research on non-conventional modalities. Future explanatory models of mental illness will take into account established Western scientific theories, emerging paradigms, and non-Western healing traditions. In this process Western psychiatry will become a truly integrative paradigm yielding more complete understandings of biological, informational and “energetic” processes associated with mental illness. A future more integrative psychiatry will emerge from a synthesis of disparate explanatory models of mental illness. More complete understandings of complex dynamic relationships between biological, somatic, energetic, informational, and possibly also spiritual processes associated with symptom formation will lead to more effective assessment and treatment approaches addressing causes or meanings of symptoms at multiple inter-related hierarchic levels. Future studies on meditation, healing intention, meditation and prayer will elucidate the role of consciousness in health and healing.

It is likely that the theories and methods that comprise conventional biomedicine and biomedical psychiatry in the early 21st century will follow one of two possible future evolutionary pathways resulting in either continued conservative growth or radical change. Although it will not be necessary to go outside the established paradigm of contemporary biomedicine in order to develop a conceptual framework for integrative medicine, the empirical validation of novel assessment and treatment approaches will require the rigorous evaluation of novel concepts in physics, chemistry and biology. This conservative pathway does not assume or require the violation of orthodox scientific models of reality based on implicit assumptions of linear causal interactions between discrete particles in order to explain illness and health. However the conservative model does assume that important future directions in medical research will not be completely determined by currently entrenched economic, institutional or intellectual dogma influencing beliefs and research studies in academic centers. A more radical pathway is conceivable in which an increasingly eclectic framework of conventional biomedicine will progressively embrace novel ideas in physics and neuroscience as well as concepts from non-conventional systems of medicine that rest on assumptions currently outside of the orthodox paradigm (Rubik 1996; Liboff 2004; Jonas & Crawford 2004). If intellectual, institutional and economic trends favor the more radical pathway in the coming decades it is likely that conventional biomedicine – and along with it biomedical psychiatry – will gradually transform into a fundamentally new paradigm that will have little resemblance to mental health care of the early 21st century.

Regardless of whether future mental health care undergoes gradual conservative changes or radical transformation, practical clinical advances tracking the conceptual evolution of medicine will result in an increasingly “whole person” systems approach that will more

adequately address the underlying causes and meanings of mental illness. This systems approach will incorporate the broad range of both conventional and alternative therapies. By employing individually tailored treatments integrative mental health care will more adequately address unique needs and concerns of each patient including their physical and psychological well-being, social relationships, and spiritual values. Novel scientific models of complex relationships between biological, energetic, and informational processes associated with mental illness will lead to more effective integrative assessment and treatment strategies addressing the causes or meanings of symptoms at multiple hierarchical levels of body-brain-mind. This evolutionary process will result in an increasingly integrative perspective in conventional biomedicine and novel explanatory models of illness and healing that address the assumptions underlying contemporary Western science and medicine. This trend will accelerate in the first half of the 21st century in response to increasing intellectual openness in Western culture to non-biomedical systems of medicine and ongoing advances in the basic sciences resulting in evolution of the conceptual foundations and clinical therapeutics of conventional biomedical psychiatry into a more sophisticated model of care incorporating both scientific and intuitive understandings of normal psychological functioning and the complex psychological, biological, energetic and informational factors contributing to mental illness.

In the coming decade mental health care will emerge as a more eclectic and more open paradigm responding to research advances in both biomedicine and alternative medicine. Congressionally mandated reforms will progressively restrict the influence of the pharmaceutical industry on research in both academic psychiatry and the private sector. Quality manufacturers of select CAM modalities will become established players in an increasingly diversified healthcare marketplace in which private insurance and Medicare will cover select alternative therapies that will have parity with conventional biomedical treatments. Under reforms in health care policy that will come into effect in this decade, government, industry and academic research centers will work in a more coordinated fashion to develop systematic research programs on a wide range of assessment and treatment modalities resulting in more effective and more cost-effective treatment choices addressing urgent unmet needs of mental health care in the U.S. and other western countries. Increased collaboration between researchers and clinicians in the U.S. and internationally will help advance and accelerate evolution towards integrative mental health care.

The first decades of the 21st century will bring a gradual transition away from psychopharmacology as the dominant mode of treatment toward increasing reliance on advanced technologies for alleviating serious mental illness. Growing global access to broadband internet services will permit patients to benefit from psychotherapy through "tele-presence," advanced biofeedback techniques and virtual reality exposure therapy, and therapist "avatars" in the comfort of their homes. By the year 2050 psychiatrists and other mental health practitioners will routinely use a scientifically validated integrative "tool kit" incorporating the most advanced biomedical technologies together with empirically validated traditional healing practices. The more integrative mental health care of the future will permit more accurate assessment of biological, energetic and informational factors associated with symptoms and lead to individualized multi-level treatment strategies addressing the unique pattern of biological, energetic and informational factors associated with each patient's unique symptoms. The transformation of biomedical psychiatry to integrative mental health care will result in deeper understandings of mental illness, improved and more rapid treatment response, and reduced costs.

By mid-century a new paradigm will be solidly established and will inform the theories and clinical therapeutics of mental health care. Biomedical theory will be informed by complexity theory, novel theories in physics and information science and accumulating findings from the basic sciences and consciousness research. There will no longer be a rigid dichotomy between biomedical and alternative modalities. By mid-century advances in the genetics and neurobiology of mental illness will have yielded more specific, more effective and more individualized pharmacological, genetic and energetic therapies for major psychiatric disorders. Rigorously designed Western-style research studies will have verified the mechanisms of action of some non-conventional biological, mind-body and so-called “energy” modalities and validated their therapeutic claims. By the same token many contemporary conventional and alternative modalities will have been discredited as lacking efficacy by well designed studies and will no longer be used. Treatments that will be abandoned in the coming decades will include many conventional pharmacological therapies and psychotherapeutic treatments in current widespread use as well as natural products from diverse healing traditions. In parallel with these changes on-going advances in functional brain imaging will permit studies on postulated roles of magnetic fields, biophotons, and macroscopic highly coherent quantum field effects on normal brain functioning and mental illness.

10. Concluding remarks

Mental health care as practiced today is in urgent need of new ideas, better, safer, more affordable and more compassionate approaches to the prevention and treatment of mental illness. The future of mental health care is being shaped by emerging paradigms in the basic sciences, increasing openness to non-Western systems of medicine, changing clinicians’ attitudes, but most of all by our patients’ demands for better, more personalized and more compassionate care.

The theoretical foundations and clinical practices of mental health care will continue to evolve as biomedicine begins to explore perspectives that recognize complex inter-relationships in brain-body-mind, for example, the field of psychoneuroimmunology, an integrative paradigm which reconciles non-biomedical systems of medicine with contemporary biomedicine has been emerging for some time now and yield significant improvements in the day to day practice of mental health care (Irwin 2008). A more robust theory of mental illness causation will require novel research methodologies to adequately address complex psychological, neurochemical, immunological and energetic mechanisms associated with both normal brain functioning and mental illness. The new paradigm that is emerging from advances in functional brain imaging, genetics, and molecular biology will be capable of elucidating complex relationships between the biological and electromagnetic (possibly also quantum-level) activity of the brain and body in healthy individuals, as well complex factors underlying cognitive, affective and behavioral symptoms. The new paradigm will be highly integrative taking into account both classically described biological factors including neurophysiological and immunological functioning as well a non-classical phenomena, including the postulated role of macroscopic coherent quantum fields in neuronal activity associated with human consciousness (Pizzi 2004; Thaheld 2001). The disparate viewpoints of biomedicine and non-Western healing traditions call for conceptual bridges between different systems of medicine and practical strategies for integrating therapeutics used in different cultures. Future technologies may eventually result in empirical validation of “Qi” or other non-Western concepts of “energy” however important

differences will probably persist between the theories and clinical practices of biomedicine and non-conventional healing traditions.

11.

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12. References

- Abbot N. Healing as a therapy for human disease: a systematic review. *J Altern Complement Med.* 2000;6:159-169.
- Ackerman J The biophysics of the vascular autonomic signal and healing *Frontier Perspectives* Fall 2001, 10:2, 9-15
- Amanda J. Myers, Ph.D., and Charles B. Nemeroff, M.D., Ph.D. *New Vistas in the Management of Treatment-Refractory Psychiatric Disorders: Genomics and Personalized Medicine*, Focus 8:525-535, Fall 2010
- Astin, J. Why Patients use alternative medicine, *JAMA* May 20, 1998a, 279:19, 1548-1553.
- Astin, J., Harkness, E., and Ernst, E. (2000) the efficacy of "Distant Healing": A systematic review of randomized trials. *Annals of Internal Medicine.* 13(11:903-910.
- Astin, J., Marie, A, Pelletier, K. et al A review of the incorporation of complementary and alternative medicine by mainstream physicians, *Arch Intern Med*, 158: Nov 23, 1998b, 2303-10.
- Astin, J., Marie, A, Pelletier, K. et al A review of the incorporation of complementary and alternative medicine by mainstream physicians, *Arch Intern Med*, 158: Nov 23, 1998b, 2303-10.
- Auyang S *Foundations of complex-system theories in economics, evolutionary biology, and statistical physics* Cambridge Univ. Press, Cambridge, England 1998.
- Bajpai RP. Quantum coherence of biophotons and living systems. *Indian J Exp Biol.* 2003 May;41(5):514-27.
- Bandettini, P. A. (2009) What's new in neuroimaging methods? *Ann N Y Acad Sci*, 1156, 260-93.
- Bares M, Brunovsky M, Kopecek M, Stopkova P, Novak T, Kozeny J, Höschl C. Changes in QEEG prefrontal cordance as a predictor of response to antidepressants in patients with treatment resistant depressive disorder: a pilot study. *J Psychiatr Res.* 2007 Apr-Jun;41(3-4):319-25. Epub 2006 Aug 4.
- Barnes P Powell-Griner E McFann K Nahin R *Complementary and alternative medicine use among adults: United States, 2002* *Seminars in Integrative Medicine* 2:2; 54-71, 2004.
- Barnes PM, Bloom B. *Complementary and Alternative Medicine Use Among Adults and Children: United States 2007.* National health statistics reports: no 12, Hyattsville, MD: National Center for Health Statistics 2008.
- Bell I Caspi O Schwartz G Grant K Gaudet T et al Integrative medicine and systemic outcomes research *Arch Intern Med* 2002;162:133-140.
- Birks J. Cholinesterase inhibitors for Alzheimer's disease *Cochrane Database Syst Rev.* 2006 Jan 25;(1)
- Bland J New functional medicine paradigm: dysfunctional intercellular communication *Int Jour Integrative Medicine* 1:4;July/Aug 1999;11-16.

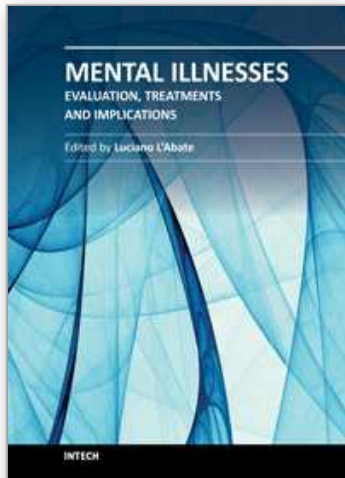
- Blankert B, Tangermann M, Vidaurre C, Fazli S, Sannelli C et al The Berlin brain-computer interface: non-medical uses of BCI technology, *Neuroprothesis* (add volume, date)
- Bolwig TG, Hansen ES, Hansen A, Merkin H, Prichep LS. Toward a better understanding of the pathophysiology of OCD SSRI responders: QEEG source localization. *Acta Psychiatr Scand*. 2007 Mar;115(3):237-42.
- Bouchard, S Paquin B Payeur R Allard M Rivard V Fournier T Renaud P Lapierre J Delivering cognitive-behavior therapy for panic disorder with agoraphobia in videoconference *Telemedicine Jour and e-Health* 10:1, 2004; 13-25.
- Bouchard S Payeur R Rivard V Allard M Paquin B Renaud P Goyer L Cognitive behavior therapy or panic disorder with agoraphobia in videoconerence: preliminary results. *Cyberpsychol Behav* 2000;3:999-1008.
- Botella C Banos R Guillen V et al Telepsychology: public speaking fear treatment on the Internet *Cyberpsychol Behav* 3:6:959-968, 2000.
- Brinkmeyer J, Grass-Kapanke B, Ihl R. EEG and the Test for the Early Detection of Dementia with Discrimination from Depression (TE4D): a validation study. *Int J Geriatr Psychiatry*. 2004 Aug;19(8):749-53.
- Chen, K. an analytic review of studies on measuring effects of external Qi in China, *Review Article, Alt. Therapies* July/Aug 2004 10:4 38-50
- Cohen S, Popp FA. Biophoton emission of human body. *Indian J Exp Biol*. 2003 May;41(5):440-5.
- Curtis B Hurtak J Consciousness and quantum information processing: uncovering the foundation for a medicine of light *JACM* 10;1:2004, 27-39.
- Day S Schneider P Psychotherapy using distance technology: story and science *J Counseling Psychol* 2002; 49:499-503.
- Delgado PL, Moreno FA. Role of norepinephrine in depression *J Clin Psychiatry* 2000;61 Suppl 1:5-12
- Deslandes A, Veiga H, Cagy M, Fiszman A, Piedade R, Ribeiro P. Quantitative electroencephalography (qEEG) to discriminate primary degenerative dementia from major depressive disorder (depression). *Arq Neuropsiquiatr*. 2004 Mar;62(1): 44-50. Epub 2004 Apr 28.
- Di Stefano V. Holism and complementary medicine: origins and principles. *Crows Nest, NSW: Allen & Unwin*; 2006.
- Dixon M Sweeney K The human effect in medicine: theory, research and practice *Radcliffe Medical Press, Oxford*, 2000.
- Eisenberg, D., Davis, R., Ettner, S, et al, Trends in alternative medicine use in the United States, 1990-1997: results of a follow-up national survey, *JAMA* November 11, 1998, 280:18, 1569-75.
- Elitzur A Dolev S Kolenda N Eds., *Quo Vadis Quantum Mechanics?* Springer New York and Berlin, 2005.
- Emmelkamp P Bruynzeel M Drost L Van der Mast C Virtual reality treatment in acrophobia: a comparison with exposure in vivo *Cyberpsychology Behav* 4:3; 335-339 2001.
- Fountoulakis KN, Vieta E. Treatment of bipolar disorder: a systematic review of available data and clinical perspectives. *Int J Neuropsychopharmacol*. 2008 Nov;11(7):999-1029.
- Fournier JC, DeRubeis RJ, Hollon SD, Dimidjian S, Amsterdam JD, Shelton RC, Fawcett J. Antidepressant drug effects and depression severity: a patient-level meta-analysis. *JAMA*. 2010 Jan 6;303(1):47-53.

- Grof S Beyond the brain: birth, death and transcendence in psychotherapy State Univ. of New York Press, Albany, NY 1985.
- Hammer L Qualities as signs of psychological disharmony, Ch 15 pp. 539-594, in Chinese Pulse Diagnosis: a contemporary approach Eastland Press, Seattle, WA. 2001.
- Hankey A Are we close to a theory of energy medicine? JACM 10;1:2004, 83-86.
- Horrobin D. Schizophrenia as a membrane lipid disorder which is expressed throughout the body. *Prostaglandins Leukot Essent Fatty Acids*. 1996;55:3-7.
- Horrobin D. The membrane phospholipid hypothesis as a biochemical basis for the neurodevelopmental concept of schizophrenia. *Schizophr Res*. 1998;30:193-208.
- Irwin MR. Human psychoneuroimmunology: 20 years of discovery. *Brain Behav Immun*. 2008;22:129-139.
- Irwin MR. Human psychoneuroimmunology: 20 years of discovery. *Brain Behav Immun*. 2008 Feb;22(2):129-39. Epub 2007 Oct 29
- Jibu M and Yasue K Quantum brain dynamics and consciousness: an introduction, Vol. 3 in Advances in consciousness research Eds. Stamenov M and Globus G, John Benjamin Publishing Company, Philadelphia, PA., 1995.
- John ER, Prichep LS, Winterer G, Herrmann WM, diMichele F, Halper J, Bolwig TG, Cancro R. Electrophysiological subtypes of psychotic states *Acta Psychiatr Scand*. 2007 Jul;116(1):17-35.
- Jonas, W Crawford C eds., Healing, Intention and Energy Medicine: science, research methods and clinical implications, Churchill Livingstone New York, N.Y. 2003.
- Katzman MA. Current considerations in the treatment of generalized anxiety disorder *CNS Drugs*. 2009;23(2):103-20.
- Kendler, K. A Psychiatric Dialogue on the Mind-Body Problem, [Perspectives: Reviews and Overviews] *J. Am Psych Assn* 158:7 July 2001 989-1000.
- Kessler R Soukup J Davis R Foster D Wilkey S et al The use of complementary and alternative therapies to treat anxiety and depression in the United States *Am J Psychiatry* 158:289-294; 2001.
- Kirsch I Moore T Scoboria A Nicholls S The emperor's new drugs: an analysis of antidepressant medication data submitted to the U.S. Food and Drug Administration. *Prevention & Treatment* 5:Article 23, 2002. available at www.journals.apa.org/prevention/volume5/toc-jul15-02.html.
- Kirsch I. Challenging received wisdom: antidepressants and the placebo effect. *Mcgill J Med*. 2008 Jul;11(2):219-22.
- Kleinman A. Rethinking psychiatry: from cultural category to personal experience The Free Press, New York City, N.Y. 1988.
- Korotkov K Williams B Wisneski L Assessing biophysical energy transfer mechanisms in living systems: the basis of life processes *JACM* 10;1:2004, 49-57.
- Krusienski DJ, Grosse-Wentrup M, Galán F, Coyle D, Miller KJ, Forney E, Anderson CW. Critical issues in state-of-the-art brain-computer interface signal processing *J Neural Eng*. 2011 Apr;8(2):025002
- Langevin, H., Badger, G, Povolny, B, Davis, R, Johnston A, et al Yin and Yang Scores: A new method for quantitative diagnostic evaluation in traditional Chinese Medicine Research *JACM* 10:2 2004 389-395.
- Liboff A toward an electromagnetic paradigm for biology and medicine *JACM* 10;1:2004, 41-47.

- Lin K Ethnicity, pharmacogenetics and psychopharmacotherapy, [abstract 44A], Symposium 44: culture, ethnicity, race and psychopharmacology: new research perspectives, 2004 Annual APA Meeting, New York, N.Y.
- Lopez-Munos F, Alamo C., Historical Evolution of the Neurotransmission Concept, *J Neural Transm.* 2009 May;116(5):515-33. Epub 2009
- Lorimer D *Science, consciousness and ultimate reality* Imprint Academic, Exeter, England 2004.
- Manchanda M McLaren P Cognitive behavior therapy via interactive video *J Telemed Telecare* 1998;4 (Suppl 1):53-55.
- McArdle JJ. Latent variable modeling of differences and changes with longitudinal data *Annu Rev Psychol.* 2009;60:577-605.
- McCraty, R Atkinson M Tomasino D *Science of the Heart: Exploring the role of the heart in human performance—an overview of research conducted by the Institute of HeartMath*, Publication 01-001, HeartMath Research Center, Boulder Creek, CA 2001.
- Mercier C King S A latent variable causal model of the quality of life and community tenure of psychotic patients *Acta Psychiatr Scand* 1994;89:72-77
- Miller A *Advances in psychopharmacology: immune system pathology in psychiatric disease*, p. 331 [abstract in “Advances in psychopharmacology,” May, 2004 APA New York, N.Y.)
- Miller D *Homeodynamics in consciousness* *Advances Fall/Winter 2003*, 19;3/4:35-46.
- Möller HJ, Maier W. [Problems of evidence-based medicine in psychopharmacotherapy: problems of evidence grading and of the evidence basis for complex clinical decision making]. [Article in German] *Nervenarzt.* 2007 Sep;78(9):1014-27.
- Morowitz H, Singer J Eds., *The mind, the brain, and complex adaptive systems Vol 22, proceedings of the Santa Fe Institute studies in the sciences of complexity*, Addison-Wesley Publishing Co., Menlo Park, CA. 1995.
- Muller N, Schwarz M. Schizophrenia as an inflammation-mediated dysbalance of glutamatergic neurotransmission. *Neurotox Res.* 2006;10:131-148.
- Müller N, Schwarz MJ. The immune-mediated alteration of serotonin and glutamate: towards an integrated view of depression. *Mol Psychiatry.* 2007 Nov;12(11):988-1000. Epub 2007 Apr 24.
- Nadeau R Kafatos M *The non-local universe: the new physics and matters of the mind*, Oxford Univ. Press, Oxford, England 1999.
- Nemeroff C Kilts C Berns G *Functional brain imaging: twenty-first century phrenology or psychobiological advance for the millennium?* *Am J Psychiatry* 156:5, May 1999, p. 671-673
- Penrose R *Shadows of the mind: a search for the missing science of consciousness* Oxford Univ. Press, Oxford, England 1994.
- Pertaub D Slater M Barker C *An experiment on fear of public speaking in virtual reality* In: *Medicine Meets Virtual Reality 2001*, Vol 81 Westwood J Hoffman H Mogel G Stredney D eds. Amsterdam IOS Press 2001.
- Pizzi R *Non-local correlation between human neural networks on printed circuit board*, abstract presented at Tucson Conf. on Consciousness, April 2004 (pizzi@dti.unimi.it) NOTE: get final citation and final paper.
- Popp FA. Properties of biophotons and their theoretical implications. *Indian J Exp Biol.* 2003 May;41(5):391-402.
- Rasgon N Pumphrey L Prolo P Elman S Negrao A et al *Emergent oscillations in mathematical model of the human menstrual cycle* *CNS Spectrums* 2003;8(11):805-814.

- Rees, L Integrated medicine: imbues orthodox medicine with the values of complementary medicine *BMJ*, 2001, 322: 119-120
- Rein G bioinformation within the biofield: beyond bioelectromagnetics *JACM* 10;1:2004, 59-68.
- Reynolds C, Lewis D, Detre T, Schatzberg A, Kupfer D. The future of psychiatry as clinical neuroscience, *Acad Med* 2009 April; 84(4):446-450.
- Rubik B Ch. 5 "toward an emerging paradigm for biology and medicine," in *Life at the Edge of Science*, The Inst for frontier science, Oakland, CA. 1996
- Rubik B *Life at the edge of science: an anthology of papers by Beverly Rubik*, The Institute for Frontier Sciences Oakland, CA. 1996.
- Sarris, J., Goncalves, D., Robins Wahlin, T.-B. & Byrne, G. (2010a) Complementary Medicine Use by Middle-aged and Older Women: Personality, Mood and Anxiety Factors *Journal of Health Psychology*, In press.
- Sarris, J., Kavanagh, D. & Byrne, G. (2010b) Adjuvant use of nutritional and herbal medicines with antidepressants, mood stabilizers and benzodiazepines. *J Psychiatr Res*, 44, 32-41.
- Sarris, J., Schoendorfer, N. & Kavanagh, D. (2009) Major depressive disorder and nutritional medicine: a review of monotherapies and adjuvant treatments. *Nutr Reviews*, 67, 125-31.
- Schlitz, M., and Braud, W. (1997) Distant intentionality and healing: Assessing the evidence. *Alternative Therapies in Health and Medicine*. 3(6): 62-73.
- Schuck J Chappell T Kindness G Causal modeling and alternative medicine *Alt Therapies* March 1997;3:2, 40-47.
- Shang C Emerging paradigms in mind-body medicine *JACM* 7;1:2001, 83-91.
- Snyder S Ferris C Novel neurotransmitters and their neuropsychiatric relevance *Am J Psychiatry* 2000;157:1738-1751).
- Sperner-Unteweger B. Immunological aetiology of major psychiatric disorders: evidence and therapeutic implications. *Drugs*. 2005;65:1493-1520.
- Standish, L.J. , Johnson, L.C., Kozak, L., and Richards, T. (2003) Evidence of correlated functional magnetic resonance imaging signals between distant human brains. *Alternative Therapies in Health and Medicine*. 9(1): 128-(need last page)
- Standish, L.J., Johnson, L.C., Kozak, L., and Richards, T. (2001) Neural energy transfer between human subjects at a distance. Paper presentation at: Bridging worlds and filling Gaps in the Science of Healing. Kona, Hawaii.
- Starfield B Is U.S. health really the best in the world? *JAMA* 2000 July 26;284(4):483-5.
- Strogatz S Exploring complex networks *Nature* 410;2001:268-276.
- Strous RD, Shoenfeld Y. Schizophrenia, autoimmunity and immune system dysregulation: a comprehensive model updated and revisited. *J Autoimmun*. 2006;27:71-80.
- Sussman N The "file-drawer" effect: assessing efficacy and safety of antidepressants *Primary Psychiatry* July 2004 p. 12.
- Tajima K, Fernández H, López-Ibor JL, Carrasco JL, Díaz-Marsá M. Schizophrenia treatment. Critical review on the drugs and mechanisms of action of antipsychotics. *Actas Esp Psiquiatr*. 2009 Nov-Dec;37(6):330-42.
- Tangrea J Adrianza E Helsel W Risk factors for the development of placebo adverse reactions in a multicenter clinical trial *Annals of Epidemiology* 1994;4:327-331.
- Thaheld F Proposed experiment to determine if there are EPR nonlocal correlations between two neuron transistors *APEIRON* 7:3-4, July-Oct 2000 202-205

- Thase M Antidepressant effects: the suit may be small, but the fabric is real *Prevention & Treatment* 5:Article 32, 2002. available at journals.apa.org/prevention/volume5/toc-jul15-02.html.
- Thase ME. Do antidepressants really work? A clinicians' guide to evaluating the evidence. *Curr Psychiatry Rep.* 2008 Dec;10(6):487-94.
- Tindle H Davis R Phillips R Eisenberg D Trends in use of complementary and alternative medicine by U.S. adults: 1997-2002 *Alt Ther Health Med* 2005;11:1;42-49.
- Tononi G Edelman G Consciousness and complexity *Science* 282;1998:1846-1851.
- Turner R Lukoff D Barnhouse R Lu F Religious or spiritual problem: A culturally sensitive diagnostic category in the DSM-IV. *The Journal of Nervous and Mental Disease,* 1996;183(7): 435-443.
- Unutzer J Klap R Sturm R Young A Marmon T et al Mental disorders and the use of alternative medicine: results from a national survey *Am J Psychiatry* 157:1851-1857; 2000.
- Unutzer J. et al. Surveys of CAM: Part V—use of alt and comp ther...psychiatric and neurologic diseases *JACM* 8:1, 93-96, 2002
- Unutzer J. et al. Surveys of CAM: Part V—use of alt and comp ther...psychiatric and neurologic diseases *JACM* 8:1, 93-96, 2002
- Venneman S, Leuchter A, Bartzokis G, Beckson M, Simon SL, Schaefer M, Rawson R, Newton T, Cook IA, Uijtdehaage S, Ling W. Variation in neurophysiological function and evidence of quantitative electroencephalogram discordance: predicting cocaine-dependent treatment attrition. *J Neuropsychiatry Clin Neurosci.* 2006 Spring;18(2):208-16.
- Wackermann, J. (2003) Dyadic correlations between brain functional states: Present facts and future perspectives. *Mind and Matter.* 2(1): 105-122.
- Wijk EP, Wijk RV. Multi-site recording and spectral analysis of spontaneous photon emission from human body. *Forsch Komplementarmed Klass Naturheilkd.* 2005b Apr;12(2):96-106.
- Wilber K *Integral psychology: consciousness, spirit, psychology, therapy* Shambhala Publications, Boston, MA. 2000.
- Wilber K *Quantum questions: mystical writings of the world's greatest physicists* Shambala Press, Boston, MA., 2001.
- Wright J and Potter P *Psyche and Soma: physicians and metaphysicians on the mind-body problem from antiquity to enlightenment* Clarendon Press, Oxford, England 2003.
- Yang JM, Choi C, Hyun-hee , Woo WM, Yi SH, Soh KS, Yang JS, Choi C. Left-right and Yin-Yang balance of biophoton emission from hands. *Acupunct Electrother Res.* 2004;29(3-4):197-211.
- Yasue K Jibu M Senta T No Matter, Never Mind *Proceedings of "Toward a science of consciousness: fundamental approaches (Tokyo 1999), Vol. 33 in Advances in consciousness research,* John Benjamins Publishing Company, Philadelphia, PA., 2001.
- Zahourek R Intentionality forms the matrix of healing: a theory *Alt Therapies* 10;6, 2004: 40-49.
- Zhan C Miller M Excess length of stay, charges, and mortality attributable to medical injuries during hospitalization *JAMA* 2003;290:1868-1874.
- Zhang, Chang-Lin, "Skin resistance vs body conductivity: on the background of electronic measurement on skin," *Frontier Perspectives,* 2002; 11:2, 15-25.



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In the book "Mental Illnesses - Evaluation, Treatments and Implications" attention is focused on background factors underlying mental illness. It is crucial that mental illness be evaluated thoroughly if we want to understand its nature, predict its long-term outcome, and treat it with specific rather than generic treatment, such as pharmacotherapy for instance. Additionally, community-wide and cognitive-behavioral approaches need to be combined to decrease the severity of symptoms of mental illness. Unfortunately, those who should profit the most by combination of treatments, often times refuse treatment or show poor adherence to treatment maintenance. Most importantly, what are the implications of the above for the mental health community? Mental illness cannot be treated with one single form of treatment. Combined individual, community, and socially-oriented treatments, including recent distance-writing technologies will hopefully allow a more integrated approach to decrease mental illness world-wide.

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