

*Submitted to The American Homeopath, April, 2008*

## **The Evolution of Homeopathic Theory-Driven Research and the Methodological Toolbox**

Iris R. Bell, MD MD(H) PhD

*"I'm like a man who's been half-asleep all his life, trying to find out what he was like before he woke up."*

- Charlie in Daniel Keyes' novel, *Flowers for Algernon*

### **Introduction**

The purpose of this paper is to update the homeopathic community on the state-of-the-science in homeopathic research. Emerging data and new theoretical work are creating a quiet revolution in homeopathy of which clinicians in practice may not as yet know. These findings do not simply tilt at the windmill of trying to "prove" the validity of homeopathy to extreme skeptics (who will never be convinced), but, rather, provide a modern foundation for advancing the field overall and improving the clinical care available to patients. Extensive references are provided as resources for interested readers to use in rational discussions with not only other homeopaths, but also non-homeopathic colleagues currently unfamiliar with research progress in homeopathy. Skeptics and other people who are simply unaware of the research literature have the incorrect belief that there is "no" research evidence supporting the plausibility of homeopathy, biological effects of remedies, or the clinical effectiveness of homeopathic treatment. On the contrary, the evidence is published and accessible.

The progress falls into at least 4 specific areas: (1) introducing new strategies for designing randomized clinical trials that have greater external validity (faithfulness and relevance to actual homeopathic clinical practice); (2) developing a peer-reviewed, accessible literature of clinical observational studies on thousands of patients with acute and/or chronic conditions and adapting the tools of qualitative research methods; (3) synthesizing concepts from the cutting-edge science of complex nonlinear dynamical systems and network theory with homeopathic philosophy and practice theory to design theory-driven studies that advance understanding of the healing process; and (4) determining several different basic science laboratory methods for documenting the nature of homeopathic remedies to address the skeptics' long-standing molecular implausibility argument against homeopathy.

In short, homeopathic research is moving forward – internationally -- in exciting ways. At the same time, reasons for the political divide between allopathic and homeopathic perspectives on health care are becoming even more clarified in the research arena. Classical homeopathy holds not only a vitalistic rather than materialistic (allopathic) philosophy at its core, but the research methodology approaches most likely to help us understand homeopathy more deeply also fall into some allopathically less well-known and/or less well-accepted scientific approaches. Even though respected in scientific fields outside biomedicine, these methods are currently at the frontiers and sometimes fringes of biomedical research, such as qualitative methods and nonlinear dynamical complex systems and network science.

A key strategy for homeopathic researchers involves learning the language and current scientific interests of allopathic researchers in order to bridge the chasm between homeopathy and allopathy. As this paper will outline, the surprising results of a dialogue will include new ways of understanding and performing research on traditional homeopathic concepts such as health and disease (attractor patterns), miasms (epigenetics), center of gravity and suppression (networks), aggravations prior to improvements (dynamical destabilization, bifurcations, cusp catastrophes),

Hering's Law of Cure (self-organization), and even succussion in remedy preparation (epitaxy and turbulence with changes in pressure within liquids).

### **Modifications of Randomized Controlled Trial Designs in Homeopathy**

When clinicians, insurance companies, and academics refer to “evidence-based practice,” they generally assume that the placebo-controlled, double-blind randomized controlled trial (RCT) is the gold standard for deciding whether or not a treatment “works”.<sup>1,2</sup> The objective of an RCT design, which was introduced as a procedure for testing pharmaceutical drugs, is to determine if a given treatment prospectively (going forward in time) has specific biological effects above and beyond those that occur during treatment with a biologically inert placebo.

A placebo is a treatment indistinguishable from the verum intervention in terms of appearance, taste, smell, etc. but without the presumptive “active” ingredient to exert any direct biological effect. The assumption is that any changes are due to the psychology of the recipient (e.g., expectations, assignment of meaning), or, perhaps to the natural course of the disease.<sup>3-7</sup> A recent study found that telling people that one placebo pill cost much more than another identical placebo pill led to higher ratings of pain-alleviating effects, apparently on the basis of perceptions of effectiveness based on cost alone.<sup>8</sup> Notably, studies suggest that there are no universal placebo responders in the population and that the size of the placebo effect varies greatly from study to study.<sup>9,10</sup> Some researchers have even debated whether or not placebos are particularly powerful.<sup>11-15</sup>

RCTs give us answers on idealized mechanism-specific treatments in idealized patients, as most trials only study uncomplicated patients with a single intervention versus placebo for a short period of time (typically 2 to 4 months).<sup>16-19</sup> RCT results help guide public health and policy decisions about whether or not to recommend and spend money on a treatment for a population with a particular allopathic diagnosis. A major limitation of applying RCT results to individual cases, even for drugs, is that the results provide group averages for the verum treatment versus placebo patients. Consequently, a clinician gains only limited guidance from the results of any RCT as to how to tailor treatment for a specific individual patient in the full context of the patient's unique presentation, other concomitant conditions, other drugs and treatments, treatment preferences, capacity for compliance, and economic circumstances.<sup>20,21</sup> Applying statistical averages to the possible outcomes of a given individual in real-world practice is a risky endeavor. Even for pharmaceutical drugs, conventional medicine is moving toward individualized or personalized medicine through frontier research in systems biology, looking for genetic patterns to predict which people will be potentially helped or hurt by a specific drug.<sup>22-24</sup>

Many RCTs of “homeopathy” test a single remedy or a combination remedy for all patients with a given allopathic diagnosis.<sup>25</sup> This design flaw ignores the way classical homeopaths actually practice, that is, by individualizing remedy choice to the unique and total clinical pattern that each patient presents, irrespective of allopathic diagnosis.<sup>26</sup> Moreover, most RCTs give the homeopath one chance to choose the remedy for the duration of the study. Many homeopaths would admit that it can take them multiple interviews and feedback on responses from a patient to determine the true simillimum, i.e., multiple tries. Presumably, less experienced homeopaths are more likely to have to try more remedies before finding the “correct” one, but even seasoned masters admit that it can take more than one attempt to find the right remedy. With combinations, there is no guarantee that any of the constituents or standardized potencies will be correct for the particular individuals who happen to enter the study.

Homeopathic researchers have arrived at two different possible solutions to the above problem. One way is to have two homeopaths with similar practice styles see the patient at the same time and require agreement on the single remedy choice with a high rating for their level of confidence.<sup>27,28</sup> This method is better than having the fate of homeopathy stand or fall on the skills of a sole provider or only one remedy for all patients in a given research project, but is still susceptible to the risk that both homeopaths could miss the correct remedy the first time and the

patient not respond.<sup>29</sup> In fact, when Frei et al.<sup>30-32</sup> examined the clinical reality in children treated in an individualized homeopathy research study for attention deficit hyperactivity disorder (ADHD), they determined that it took their experienced homeopaths a median of 3 different remedies and a median of 5 months to find the treatment associated with a significant reduction in symptoms under real-world open (unblinded) screening conditions. They also recommended a research trial duration of 12 months, not 2-4 months, for homeopathy studies in ADHD.<sup>31</sup>

If a researcher designs a homeopathy study without taking these data into account, he/she runs the risk of diluting their “active” treatment group with people on individually inactive remedies, homeopathically speaking. Essentially, a varying proportion of the “active” group in a study, though receiving a real homeopathic remedy, will respond clinically to the remedy as if it were a placebo, that is, individually inert for them. The predictable result is that sometimes the “active” group will have average outcomes not significantly different from placebo group – and sometimes they will. Even if the homeopath identifies the correct remedy, an RCT study usually ends before clinicians expect to see maximal improvement in their patients. The brief duration of RCT designs for chronic conditions would miss true remedy-based therapeutic effects in many homeopathic patients, whose improvements begin to establish themselves later in the course of treatment.

Notably, once remedy response is established, homeopaths often report that their patients’ clinical improvements self-sustain for 1 to 10 years or more with infrequent and even no dose repetition and limited follow up visits with the homeopath. It may be particularly useful to compare the longitudinal course of patients who report improvements after verum individualized remedies versus those who receive complex homeopathy or placebo. The literature on the natural course of placebo effects suggests that they can peak early and dissipate within weeks or at least a few months after treatment begins.<sup>33</sup>

Furthermore, individualization may matter more for longer- rather than short-term outcomes with CAM therapies. For example, one RCT study of Chinese herbal mixtures for patients with irritable bowel syndrome found that both individualized and standardized verum herbs produced greater improvements than placebo at the end of a 16-week RCT. However, once treatment stopped, only the patients who had received individualized herbs maintained their improvement 14 weeks later.<sup>34</sup> Does individualized, classical homeopathy have a parallel advantage over placebo and/or isopathically-prescribed remedy with the passage of time? The literature has no studies on this question, to date.

Negative studies also are especially likely when the total patient sample size is small (as commonly happens in the world of limited funding for homeopathy studies), thereby leaving too few patients in the “active” group on homeopathically active remedies for them. This key point could help explain why the results of RCTs – and the meta-analyses based on collections of RCTs – sometimes are positive,<sup>25,35-40</sup> sometimes equivocal,<sup>41</sup> and sometimes negative<sup>42-44</sup> in terms of homeopathic treatment showing different outcomes from those of placebo. In some studies, therefore, the negative result is true and valid. That is, the “active” group, diluted with people given inactive, hence placebo-like remedies for them individually, does not differ on average from the actual placebo group. However, the interpretation of such findings is muddled by the failure of the study design to test homeopathy as practiced - an empirical process of clinical care, involving iterative, adaptive and interactive decision-making over time.<sup>45-47</sup>

An additional important methodological modification of RCTs that Frei et al. contributed is that they not only confirmed the ability of the remedy to reduce ADHD symptoms by half (in LM potencies), but that they showed the effects wore off in their LM responders after stopping the remedy for at least 4 weeks, early in treatment. The latter observation enabled a within-subject cross-over design. Then – and only then – did they put the pre-screened patients into a double-blind placebo-controlled randomized trial with a crossover design (each patient was assigned to active remedy followed by placebo or placebo followed by active remedy, with 6-week periods for each phase of the trial). Frei et al, using their modified RCT design, ended up

with a positive study showing that “homeopathy works” significantly better than placebo in behavioral and cognitive functions,<sup>30</sup> whereas a different small and unscreened sample for a standard RCT study, designed without the homeopathically-relevant check for remedy activity, was negative.<sup>42</sup>

These points do not mean that homeopathy can or will “work” in every well-designed study for every patient, but they suggest methodological approaches for making rigorous study designs more ecologically valid, that is, appropriate for testing homeopathy scientifically, as actually practiced.<sup>48</sup> Modified RCT methodologies, including studies termed pragmatic trials<sup>49,50</sup> in which the homeopaths can adjust treatment as they would in real-world practice, should lead to more reproducible findings across clinical studies in homeopathy than is currently the situation. The data also suggest that homeopathy probably does not work equally well for everyone.<sup>51</sup> Some acupuncture research offers a relevant precedent. Patients with recurrent cystitis who had received a particular Chinese medical diagnosis pattern did better than those with other initial Chinese diagnoses in a 4-week RCT format with 6-month follow-up.<sup>52</sup> More research effort should address the triage question: that is, who can benefit most from homeopathy and thus should get such treatment versus who should receive early referral to a different form of therapy?

One hint in the research literature already is that people who are drawn to alternative systems (complementary and alternative medicine, CAM) such as homeopathy or acupuncture have higher scores on the personality trait of openness to experience.<sup>53</sup> Personality traits usually have genetic, biological, and behavioral characteristics that can provide valuable clues for understanding how one person could respond better to homeopathy than another in the real world. For instance, the personality trait of absorption (the ability to immerse oneself in inner or outer experiences), which correlates with openness to experience, identifies fibromyalgia patients more likely to choose, when given a chance to switch groups under double-blind conditions, to remain in their randomly assigned group in which they began the study – not only for the verum group, but also even if the original group assignment turned out later to be placebo (and the placebo patients were not objectively better)!<sup>54,55</sup> In any system of care, patients who adhere to recommended treatments over time have a better chance of experiencing favorable outcomes from an active treatment than those who stop treatment altogether or move on to the next doctor or treatment too quickly, before the initial treatment would have a chance to help.<sup>56</sup>

If it takes multiple remedies and several months to find the correct remedy for a patient, someone with a chronic disease who scores low for trait absorption may well have discontinued care too soon to benefit from homeopathic care. Some data support the latter hypothesis. A recent prospective observational study showed that Danish homeopathic patients with hypersensitivity illnesses who experience the best outcomes not only start with high expectations from treatment, but they also continue in maintenance treatment one year later.<sup>57</sup>

Another methodological strategy for modifying RCT design is to look for early objective biomarkers of responsivity to predict who will and who will not turn out to respond well clinically in the course of extended treatment. One promising approach is to use quantitative electroencephalography (qEEG). Conventional researchers from UCLA demonstrated that qEEG cordance, a computed ratio derived from relative and absolute power of an EEG frequency and correlated with neuroimaging techniques such as SPECT or PET brain scans, is measurably and uniquely different early in treatment for patients with major depression who turn out weeks later to be good antidepressant drug responders.<sup>58-60</sup> The drug responders exhibit a qEEG theta cordance pattern opposite to that of the eventual placebo responders. Both active and placebo responders differ from patients who fail to respond to active or placebo treatment.

Bell et al. adapted and extended the qEEG cordance method in their RCT of homeopathy in fibromyalgia patients, using olfactory administration of LM liquid remedy versus plain solvent in brief sniffs on laboratory test days.<sup>61</sup> The patients on active remedy who had shown a significantly larger difference between qEEG alpha cordance during double-blind remedy sniffs versus those during plain solvent control sniffs exhibited the best clinical outcomes 3 months

later, compared with non-responders to “active” remedies and patients on placebo. In other words, it may be possible on initial treatment to screen brain wave patterns identifying patients for whom the homeopath(s) have chosen a remedy that will turn out to be clinically effective. Once screened with qEEG, the potential responders would be the patients entered into the double-blind RCT. Potential non-responders from the screening phase would never enter the double-blind phase of the study and thus not weaken the statistical power of the study to find an effect of active homeopathic treatment versus placebo, if present.

Notably, in the fibromyalgia study, excellent responders were defined in a manner consistent with homeopathic practice,<sup>61</sup> not merely in accord with allopathic standards for “good” outcomes. That is, it was not enough for a patient to have markedly less tender point pain on double-blind examination (a local effect); an excellent responder also had to score markedly better on their global rating for overall health (a global or patient-centered outcome). Some of the placebo patients had less pain and some placebo patients had better global health ratings, but no placebo patients at 3 months had both better global health and less tender point (local) pain. Such findings suggest the value of requiring drugs and placebos to meet homeopathic outcome standards – i.e., of producing *patterns* of improvements both in overall well-being/health and local symptoms, not just one or the other type of outcome, or even just in a list of multiple outcomes. Doing so will require allopathic drugs to compete in the person-wide homeopathic outcome arena, not merely their own, more narrow definition of one effect at a time.<sup>48</sup>

The current mainstream research political climate requires homeopathic remedies to perform as well as specific drugs in the allopathic drug arena, but ignores the usual nature of homeopathic clinical outcomes for judging efficacy of a treatment. It is time to turn the tables on allopathy. Homeopathic researchers must insist on fairer evaluation of allopathic and homeopathic medicines from not only an allopathic perspective, but also a homeopathic point of view. In other words, does a treatment produce *patterns* of good global and local outcomes (as expected from homeopathic remedies), not just good local outcomes one by one (as expected from allopathic drugs).

Allopaths dismiss “non-specific” effects as unrelated in a causal way to a given treatment.<sup>9</sup> However, homeopaths predict that a single remedy can induce (cause) positive pattern outcomes in global well-being, energy, and multiple symptoms and dimensions of the person.<sup>62</sup> Terminology can interfere with proper evaluation of clinical outcomes. Treatments typically have multiple effects, some desirable and others undesirable for the patient’s overall health and well-being. Favorable effects that allopaths label as “nonspecific” for drugs in their system of medicine, i.e., improvements in symptoms other than the chief complaint and enhancements in quality of life, are actually “specific” for homeopathy’s mode of action, i.e., predicted by the theory of the intervention.<sup>7</sup> Also, good homeopathic results are not group averages computed item by item for each type of outcome. Notably, the widely-criticized<sup>63</sup> Shang et al.<sup>64</sup> meta-analysis of homeopathic RCTs published in Lancet found homeopathy no better than placebo. Shang et al. admit in their paper that they randomly chose only one outcome from each study for their analysis, even if multiple outcomes were reported. In contrast, good homeopathic outcomes clinically are profiles (pictures) of concomitant changes within the same individual. In the least, homeopathic researchers need to adapt a variety of analytic procedures already used by investigators in other fields<sup>65</sup> where multivariate patient profiles rather than in single variables and longitudinal change processes are most important (e.g., profile analysis, reference 65, pp. 391-455).

Thus, the most appropriate statistical analyses require innovative approaches to assess patterns of initial presentation and then patterns of multiple responses within the same, rather than between different, subjects over time. For example, adapting techniques from what is called phylogenetic analysis<sup>66,67</sup> involving clusters of features of a given patient or the features of a series of initial and follow-up visits with an individual patient (e.g., word use patterns from transcripts and/or nonverbal behaviors from videotapes of each clinical visit) may be one way to

begin to capture the baseline remedy picture and then the homeopathically good versus poor outcome pictures as they evolve.

At baseline, phylogenetic analytical tools could allow homeopathic researchers to test for and refine the clinical validity of remedy family and miasmatic characteristics as clusters of patient features at the beginning of treatment, as described in the diagnostic systems of Scholten<sup>68</sup> or Sankaran<sup>69</sup> and others. One study showed, for instance, that most of the plays attributed to Shakespeare sort together in particular regions for phylogenetic word use pattern, whereas most of the plays attributed to Marlowe sort into a different cluster of word use patterns. Only one of the plays attributed to Shakespeare falls into the word use pattern area where Marlowe's plays cluster.<sup>67</sup> Another analytic tool with a related purpose is grade-of-membership (GOM) analysis, which researchers have previously applied in analysis of remedy type categorization and provings data.<sup>70-72</sup> GOM looks for the degree to which an individual does or does not fall into membership in a particular category on the basis of a set of symptoms. In addition, a more mixed qualitative-quantitative approach to determining categorical domains from multiple open-ended descriptive items derived from expert opinions that card sort together is a method called concept mapping.<sup>73,74</sup> In summary, there are several different, systematic research methodologies available to study what homeopaths do in clinical diagnosis – i.e., assemble, cluster, prioritize, and weight many pieces of biopsychosocial information about an individual as a picture in order to classify the person as a whole, using a single, specific, individualized category, a remedy type.

What questions could we ask of relevance to homeopathy? They would include - Do the word use patterns of people who need plant, animal, or mineral remedies<sup>75</sup> cluster differently, e.g., using phylogenetic analysis or concept mapping of transcripts of case-taking interviews and moment-by-moment observer-coded observations of patient appearance and behaviors on videotapes? Do people with different miasmatic tendencies cluster empirically by their word use patterns into acute, psoric, sycotic, and syphilitic, let alone other proposed subtypes? We may be able to use and adapt available scientific methods to perform innovative studies and confirm, disconfirm, and/or refine proposed clinical constructs in homeopathic practice theory.

Allopathic genomics researchers are currently using phylogenetic analysis methods to characterize different multi-gene activation patterns associated with particular phenotypes in the real world.<sup>66</sup> Beyond phylogenetic analyses, however, allopathic researchers are even beginning to find evidence that genes set up risk for specific diseases, but require an interaction with the environment to be activated or inactivated in complex patterns – i.e., to manifest or not manifest a disease clinically. They have found, for instance, that cross-generational and early environment stressors such as lower socioeconomic status (SES) persistently modify the expression of genes involved in inflammation (epigenetics), thereby changing the level of risk for various subsequent allopathic diseases.<sup>76-78</sup> The latter research<sup>79</sup> suggests that homeopaths who can explain the concept of miasms as acquired disease tendencies to scientists outside their field may now find epigenetics research collaborators open to accepting the concept of miasmatic influences on health and disease expression as plausible and testable. For allopaths, their unit of analysis is the emergent behavior of a person's genes as modified by environmental interactions (phenotype); for homeopaths, their unit of analysis is the emergent behavior of the person as a whole, as modified by environmental interactions (specific remedy type). In fact, just as modern neuroimaging techniques helped acupuncture receive more serious scientific attention in recent years, contemporary genomics and epigenetics systems and multivariate-based research methods may be one route by which homeopathy can attract much greater scientific consideration.

Furthermore, effects that allopaths label as “side effects” (i.e., undesirable adverse effects in addition to any locally-desirable effects) of many allopathic drugs tend to occur less often with individually-chosen homeopathic remedies (where the single remedy is expected to cause multiple desirable improvements in multiple symptoms without adverse “side effects” – or adverse drug-drug interactions). In assessing both the positive and negative effects of a given treatment, the total picture of benefit versus risk should tilt in favor of homeopathic remedies and

against allopathic drugs, as the results of several large-scale observational studies already suggest (see below). Again, pattern analysis should reveal the fuller picture for homeopathic outcomes better than methods that evaluate only one class of outcomes at a time.<sup>80</sup>

## **Clinical Research Tools Other than Randomized Controlled Trials**

### ***The Usefulness of Observational Trials for Studying Real-World Outcomes***

In contrast with the mixed results of RCT studies of homeopathy, observational studies of all types reveal outcomes consistently favorable to homeopathy.<sup>81-94</sup> Types of observational study designs range from prospective longitudinal cohort to case-control to cross-sectional to case series. Researchers consider the case report, which is the most common way in which homeopaths report their clinical findings, to be the weakest observational design from a scientific perspective,<sup>1</sup> even though it may help other clinicians better to understand their own individual patients.

Nonetheless, as an alternative research study design from both a practical and economic perspective, some allopathic medical researchers have begun to advocate for accepting the results of well-designed observational clinical studies as just as valid and reliable as RCT studies,<sup>95,96</sup> without as much tendency to inflate bias as previously believed. The strongest design for observational studies usually involves a prospective, longitudinal evaluation of patient outcomes in which hundreds or thousands of consecutive patients are followed for many months to years.

What makes observational trials worthwhile? Even if a treatment works in an RCT, patients in the real world often fail to tolerate or even to use the treatment as prescribed for a host of possible reasons. Furthermore, long-term outcomes in real-world practice are often at odds with the findings from RCTs. As a result, the media regularly announce new warnings or outright withdrawals of FDA-approved drugs from the market, only after thousands or millions of patients have taken them, sometimes for years. Recent examples include increased cancer and cardiovascular risks from hormone replacement therapy, suicide risk from one anti-allergy drug, or increased heart attacks from certain anti-inflammatory drugs for arthritics, hypoglycemic medicines for diabetics, and antiviral drugs for HIV/AIDS. The reasons for the inability of RCTs to identify these tragic risks are complex, but likely include the use of fewer patients for shorter periods of time, enrollment of less sick patients and fewer drug-drug interactions (fewer concomitant non-study drugs are usually allowed in RCTs) in the RCT designs than occur in real world practice. As Tolle has commented, “Homeopathy and Chinese medicine are two examples of possible alternative approaches to disease that do not treat the illness as an enemy and therefore do not create new diseases.”<sup>97</sup>

Advantages of observational studies include the ability to follow larger numbers of patients for longer periods of time in the real-world context of everyday clinical care, although without randomizing or blinding the treatment given. The disadvantages of observational designs include their susceptibility to the risk of bias and expectation – e.g., patients self-select their providers and treatments. One group could end up with many younger or older people, sicker or less sick people, differential dropouts from treatment, people on varying types of additional conventional or CAM treatments in one group but not another. Any such factor could lead to incorrect conclusions about whether or not the treatment of interest in an observational study, as opposed to some other factor or an interaction of factors, was itself responsible for the outcomes.

Given those caveats, it is still striking that homeopathy performs extremely well in observational studies – large cross-sectional and prospective designs, as well as in the case series and case reports that most clinicians learn through texts, computer programs, clinical journals, and conferences. The large-sample observational studies of homeopathy in acute and chronic conditions report a 70-80% rate of clinical improvement and 80-90% rates of patient satisfaction.<sup>81-92</sup>

Preliminary systematic research on the role of the homeopath-patient relationship on outcomes suggests that greater perceived empathy by providers correlates with improvements in patients' sense of empowerment. In turn, empowerment correlates with some, but not all, clinical gains made 3 months and 12 months after the start of homeopathic treatment.<sup>98</sup> In short, the homeopath-patient relationship is important for good clinical outcomes, especially early in the treatment process, but not by any means the whole story. Also, observational studies of homeopathy demonstrate significant reductions in use of pharmaceutical drugs (and their associated costs), and better safety records than conventional drugs.<sup>99</sup>

What can practicing homeopaths do to participate in observational research? Practice-based networks of providers nationally and internationally can join with academic researchers to document results in everyday clinical practices, generating sample numbers in the hundreds to thousands, with follow-up possible for months to years, rather than only weeks (as in RCTs). Outcomes can include pattern changes in global and local symptoms rather than just in chief complaint, clinically-documented laboratory tests, medications usage, urgent care and emergency room visits and hospitalizations, complications, as well as mortality rates. Simple outcome questionnaires obtained periodically in cohorts of practice-based network patients, such as clinical global impression ratings, patient global health and individualized well-being ratings,<sup>100</sup> and quality of life questionnaire scores, can also help document outcomes.<sup>88,89,101,102</sup>

Homeopaths often report taking 6-12 months to see marked improvement in chronically ill patients, and then finding sustained improvements for 10 or more years later, with only infrequent follow-up visits or repeat remedies. Only observational studies, not RCTs, will permit the extended follow-up periods during which homeopathy could show its potential advantages over allopathic treatment for reversing the downhill trajectory of chronic illness and lowering long-term health care costs over time.

### ***The Relevance of Qualitative Research to Homeopathy***

RCTs and observational studies usually involve quantitative analyses using numbers, measurement, counts, and statistical techniques to compare average outcomes of one group with those of another group. However, in many ways, individualized homeopathic clinical practice and homeopathic provings involve assessment approaches more similar to those used by some social science researchers such as anthropologists, sociologists, educators, and nurses, namely, qualitative methods. Qualitative methods focus on collecting and analyzing information by observing what people do and say.<sup>103</sup>

Qualitative data derive from individual, detailed interviews and/or focus groups (e.g., 4-12 people, similar to the size of a prover group). Just as homeopathic case-taking depends heavily on the patient's verbal capacity for describing details of symptoms, the raw data in qualitative research are verbatim transcripts of the participants' own words from interviews, video, and/or audio recordings. Textbooks and computer programs (e.g. Ethnograph (<http://www.qualisresearch.com>), Atlas-ti (<http://www.atlasti.com/>), NVivo (<http://www.qsrinternational.com/>)) offer systematic ways to code and analyze qualitative data for patterns and themes. Applying formal qualitative research methods to homeopathic case interview and/or provings data could improve the ability of homeopaths and homeopathic researchers to describe their patients' states and changes over time.<sup>104,105</sup>

The goals of quantitative and qualitative research are different. Quantitative research, using deductive reasoning, intends to explain an outcome causally in a presumably reproducible way over large numbers of people. Qualitative research, using inductive reasoning, intends to describe a process or phenomenon, with an emphasis on identifying patterns or themes. Some researchers combine quantitative and qualitative approaches in what they term mixed method studies. Published qualitative studies in homeopathy, acupuncture, and conventional medicine reveal exploratory insights not as easily found within the more rigid, confirmatory structure of most quantitative studies.<sup>106</sup>

For most homeopaths, qualitative research methods are far more relevant to what a clinician does in practice than are quantitative methods. In fact, clinicians could enhance their case analysis skills and the quality of their provings study data with additional formal, systematic training in qualitative research methods.<sup>103,107,108</sup> Even though mainstream allopathic medical researchers place more value on quantitative rather than qualitative methods, qualitative approaches are more likely to characterize what homeopaths actually see, hear, and do in their practices. It makes practical sense to emphasize qualitative methods as highly relevant within the overall portfolio of qualitative and quantitative research efforts in homeopathy.

Future studies can also take advantage of the hundreds of already available videotaped cases recorded during intake and follow up sessions by practicing homeopaths worldwide. In the least, collaborations with qualitative researchers skilled in analyzing interview transcripts and videotaped patient behaviors could improve understanding of the evolution of change, even transformative change, in successful patients versus the stuckness of unsuccessful patients. Homeopathy needs many more qualitative research studies on what happens when patients respond well or poorly to treatment, in order to improve the quality of care for future patients and to design better quantitative studies.

### **Complexity and Network Science: Relevance to Homeopathic Research and Clinical Care**

Homeopathy is a holistic clinical system of care. The emerging science of complex systems, nonlinear dynamics, and networks, which is inherently holistic in its fundamental worldview, provides a compatible framework for thinking about the nature of homeopathy,<sup>109-116</sup> disease, and healing. All living systems, including physiological subsystems such as the brain or the heart, are complex by nature. A complex system is an indivisible, interdependent network or set of interconnected and self-organizing parts whose emergent properties (behaviors) are greater than the sum of the properties of the parts.<sup>117,118</sup> Any given complex system is actually embedded within some larger complex system, its environment, in a hierarchical but interdependent manner. In other words, the whole is greater than the sum of the parts. And, the whole and the parts intercommunicate.<sup>119</sup>

Life itself appears to depend on complex nonlinear dynamics, balanced between excess order and excess chaos.<sup>120-122</sup> Human flourishing may reflect optimal complexity (not too much order, and not too much chaos).<sup>123</sup> Dynamical systems researchers have demonstrated that aging and many diseases typically lead to a loss of complexity in behavioral and physiological dynamics.<sup>124-128</sup> Some diseases involve an excess of disorder or chaos.<sup>129</sup> Several homeopathic researchers have proposed that homeopathy is the therapeutics for healing disturbed dynamics in a person as a living system-network by optimizing complexity, balanced between order and chaos.<sup>115,116,130</sup>

In complexity, a living system's dynamics manifest at the edge of chaos on one side and excessive order on the other. Systems tend to stabilize dynamically into certain repetitive (though not identical) behavioral patterns (attractors) that permit the system to interact and evolve within its environment.<sup>123,131,132</sup> Complex and chaotic systems can end up in very different states depending on small differences in initial conditions.<sup>133</sup> Similarly, in homeopathy, remedy responses depend on the state of the person at the moment of taking the remedy. Healthy people can get sick from taking a remedy, whereas sick people can heal from taking the same remedy.<sup>134</sup> Yet, repeating a remedy that worked wondrously in the past for a seemingly similar condition may have very different clinical effects than it did the first time. Lack of reproducibility in homeopathy is often expected from a systems perspective, as the person taking the remedy has evolved over time – and is never again in exactly the same dynamical place from hour to hour, month to month, year to year. The effects of allopathic drugs are generally more reproducible than are those of homeopathic remedies. However, treatment goals within the two systems of care are very different. Allopathic drugs block fixed end organ disturbances by using brute force with continuous drug levels, whereas homeopathic remedies treat disturbed system dynamics by timed

episodic introduction of a small, salient treatment stimulus into the living system, i.e., the remedy (see below).<sup>109,134</sup>

Complex systems tend to organize structurally and dynamically in self-similar ways at every level of organizational scale (e.g., scale can be at a level of resolution of molecules, cells, organs, organ systems, person, social groups, human society, the ecosphere, or even the universe itself).<sup>118,135</sup> In like manner, homeopaths search for dynamical themes that pervade the organism's behaviors at the general, mental, and specific physical symptom behavioral levels in order to identify the correct simillimum. The behavioral pattern of the person is itself a self-similar microcosm of the behavioral pattern of the simillimum remedy in nature as part of the ecosystem from which it comes. The microcosm-macrocosm viewpoint overlaps those of other holistic systems of CAM such as traditional Chinese medicine or Ayurveda.

That is, the homeopath performs case analysis looking for self-similar dynamical patterns across every level of the person. The global level of scale involves characteristic ways in which an individual generally experiences symptoms, whether they manifest in mental, emotional, or physical planes.<sup>47</sup> A patient's generalities need to match the general symptom picture of the specific remedy (e.g., better with cold environmental temperatures, worse in a crowd, ameliorated from drinking milk, worse at 10 am daily, recurring every autumn, etc.). The next most important emphasis in the hierarchy of homeopathic practice is mental symptoms, e.g., delusion of being alone in the wilderness, sadness hearing music, all complaints aggravated by talking. Mentals represent the deepest level of a living being. Manifest mental disturbances profoundly change the way a person lives his/her life.

In nonlinear dynamics, the set of behavioral patterns toward which the system gravitates are called attractors. Unhealthy attractors (fixed point or limit cycle) tend to be tightly repetitive and inflexible or rigid – with a very limited repertoire of responses to environmental challenges (biological, physical, chemical, or social in nature).<sup>131,132,136-142</sup> When in transition between attractors (cf., a homeopathic aggravation), the system temporarily destabilizes and can sometimes shift abruptly (bifurcate) into unstable dynamics involving opposite states before settling into a new, more stable attractor, or go on to develop even more unstable (unpredictable) chaotic dynamics (Figure 1). Healthy attractors tend to have more flexibility, adaptability, and resilience in the states through which the system can move when perturbed by influences or changes in the environment.<sup>123,143</sup>

[INSERT FIGURE 1 ABOUT HERE]

Sherr aptly describes the homeopathic clinical diagnostic process as a search for stuckness in a person's behavior, i.e., the verb of the case, "repeating on every level" (i.e., a self-similar rigid attractor pattern).<sup>144</sup> Sherr goes further to describe allopathic pathological labels as a set of static nouns of little use for homeopathic diagnosis (the ultimate in fixed order or lost complexity in a system's dynamics). In systems science terms, generals are the person-system's emergent global patterns and mentals are the behavioral attractor patterns at the next highest level of organization in the network of the person, that is, the local brain with its own emergent behaviors (e.g., conscious awareness, sensations, delusions, dreams). Homeopathic stuckness translates into a rigid dynamical attractor pattern; health into an optimally complex attractor pattern (see Figure 2).

[INSERT FIGURE 2 ABOUT HERE]

Thus, it is possible to understand a homeopathic aggravation as an abrupt (discontinuous) remedy-induced bifurcation in the attractor dynamics of the individual (a cusp catastrophe, in systems terms), one that may resolve into a healthier (optimally complex) or unhealthier (overly ordered or overly chaotic) pattern with time. After any aggravation period, patients commonly

describe themselves as passing through a “foggy” period but experiencing their usual symptoms (e.g., asthma attacks), but with less frequency and less severity – a pattern predicted for a system in a phase transitional pattern of change in its dynamics. Clinically, at the social level, the healthier person behavioral dynamics can eventually manifest as an abused wife effectively confronting and overcoming the series of difficulties involved in leaving the spouse or as a grown, but dependent child getting a job, moving out on his own, and managing to set up an independent life from his parents without moving back home again.

In his classic homeopathy text,<sup>47</sup> Vithoulkas describes the importance of watching the behavioral response of the patient to a remedy dose and waiting for a recognizable symptom pattern to emerge and stabilize before repeating or changing the remedy. He observes that repeating a remedy too often can engraft a disease pattern and giving too many different remedies can make a case incurable. From a complex systems perspective, pushing a dynamical system into repeated bifurcations before it can restabilize can in fact generate chaotic dynamics, an excessively disorderly state of function beyond the healthy state of optimal complexity (Figure 1).

Health in Vithoulkas’ terms of freedom at every level of being<sup>47</sup> means that a person will react to, but nonetheless bounce back from, environmental changes/challenges (health involves resilience in the face of negativity, not a rigidly Pollyanna-like positivity). A healthy person can adapt to his/her environment without becoming stuck in a dysfunctional behavior pattern of rigidity (loss of complexity with excessive order as in a fixed point attractor pattern or a limit cycle attractor) or overwhelming disorganization (loss of complexity in the other direction, as in an extremely chaotic attractor pattern).<sup>123</sup>

Among health care systems, homeopathy appears to be unique in its actions. Homeopathy seems to destabilize a living system out of a rigid or chaotic attractor pattern of disease while providing a template for the whole person’s dynamics to shift and restabilize across global and local levels of organization into a more adaptive complex behavioral attractor pattern. Removing obstacles to cure in this scenario by improving diet, adding beneficial lifestyle habits such as exercise and meditation, avoiding chemical and social toxins, and adding social support all translate in systems terms into relocating the organism into a less challenging environmental fitness landscape in which he/she can better recover.<sup>135</sup> Early the course of treatment, the system dynamics will be more wobbly and vulnerable to reverting to old attractor patterns when exposed to environmental stressors. However, once the healthy dynamical pattern is established and stabilized with the passage of time, the dynamical system should be able to throw off adverse effects of subsequent encounters with environmental stressors.

In this way, homeopathic therapy focuses on temporality in terms of timing of the treatment stimulus (remedy dosing) and shifting dynamics of the system. In contrast, allopathic medicine largely ignores dynamics and focuses its treatment more on spatiality in terms of fixed structural lesions in end organs. Rarely, allopathic researchers in dynamical systems have tried to create new therapies by timing their interventions at different points in the system dynamics to interrupt, for instance, the abnormal electrical patterns of epilepsy or apnea.<sup>129,145</sup> Homeopaths apparently already have an empirical way to do so on an individualized basis for the system as an indivisible whole.

Homeopathic researchers should be able to document unhealthy, transitional, and healthy dynamics of individual patients by measuring the behavioral and physiological patterns during repeated assessments over time. These ideas further suggest that the best way to look for the effects of homeopathic remedies is to follow patients with repeated measurements over various time scales, both short and long-term, after the first administration of the simillimum.<sup>19</sup> Such a conceptualization translates into the importance of studying the healing process to the point of cure (the pattern and trajectory of patients over time) to capture what homeopathy claims to do for patients.

For example, what are the system dynamical effects over time of treatment with simillimum as compared with incorrect homeopathic remedy, allopathic drug, placebo, and the

natural course of the disease? Do the system dynamics revert toward an unhealthy attractor pattern when a patient antidotes or goes too long between doses of a high potency remedy? Is there a value to giving daily LM or low potency doses in water to perform small course corrections regularly in the shift toward healthier dynamics? Dynamical studies of individual patient behavioral patterns at the global (person) level of organization (e.g., mentals and generals - moods and interpersonal behaviors) and at a more local (physiological hub, heart) level (e.g., complexity of heart rate variability) during the homeopathic treatment process can begin to give clinicians richer behavioral information than just summaries of symptoms gleaned from follow up patient interviews.

In the sensation method, Sankaran's approach of watching for nonverbal behaviors (gestures) of the patient during visits may offer guidance as to which individual behavioral dynamics are most important to assess in clinical research.<sup>69,75</sup> Observing dynamical shifts during treatment may reveal if the homeopath has chosen the correct remedy and if it is still acting. Monitoring behavioral and physiological dynamics simultaneously<sup>146</sup> may also show early relapses in order to time a remedy re-dose and keep the person's system moving within a healthier attractor pattern of multidimensional behaviors toward cure.<sup>109</sup>

Complex dynamical systems researchers are able now to graph the temporal patterns of behaviors from videotapes and of physiology from continuous recordings of individual patients or social groups – and show differences between healthy and unhealthy dynamics.<sup>131,143,146,147</sup> The techniques of dynamical systems science are readily adaptable for analyzing the videotaped behaviors of patients in homeopathic interviews, their reactions to experimental stressors, and/or their physiological changes during successful and unsuccessful treatment. With interdisciplinary studies, homeopathic researchers may be able to learn more about how an effective remedy triggers constructive change and how an ineffective remedy triggers no change, limited change, or even destructive change in a patient.<sup>148</sup>

For example, developmental psychology researchers use brief videotaped sessions to evaluate the effects of successful and unsuccessful multimodal community-based therapy for children with severe conduct disorders. These investigators have demonstrated that the initially rigid parent-child dynamics either destabilize and change toward more flexible, healthier patterns leading to good outcomes, or stay inflexible and end with poor outcomes (Figure 3).<sup>143,146</sup> Using these same methods to study the process of change during homeopathic treatment in children with conduct and other behavioral disorders is an obvious next step for homeopathic researchers. Other investigators have measured differential behavioral complexity in daily mood fluctuations of persons with affective disorders<sup>149,150</sup> or in the computerized task performance of adults with other chronic psychiatric conditions such as obsessive-compulsive disorder or borderline personality disorders.<sup>142</sup> Creative tasks themselves transiently increase complexity of EEG dynamics,<sup>151</sup> whereas paternal history of alcoholism<sup>79</sup> or personal history of probable Alzheimer's disease lower EEG complexity.<sup>152</sup> Physiology researchers have shown that it is possible to differentiate patients with congestive heart failure from those with atrial fibrillation from healthy normals using complex dynamical systems analyses of heart rate variability patterns.<sup>127,128,153</sup> Utilizing these and other dynamical assessments to evaluate behaviors of the individual person and his/her physiology could provide valuable tools to study homeopathic treatment in persons with a broad range of clinical conditions, not just developmental, psychiatric, or cardiological disorders.

[INSERT FIGURE 3 ABOUT HERE]

Group data from a study of isopathic prescribing support the potential value of embarking on dynamical systems research in homeopathy. Hyland and Lewith observed evidence of the temporal effects of a clinically ineffective, but partially active homeopathic remedy (dust mite 30c) in adult asthmatics.<sup>115,154</sup> Although the allopathic outcome values for verum and placebo did

not differ at the 16 week endpoint of a conventional RCT study, the temporal patterns of change after the remedy versus placebo administration were markedly different. The remedy triggered oscillatory, sinusoidal dynamics over time in each of the outcome measures (global asthma activity, lung function performance, and self-rated mood), whereas the placebo led to much flatter, less variable values over time. The researchers concluded that even incorrect homeopathic remedies can act as stimuli to destabilize hub behaviors within the dynamics of the complex living system. Isopathic dust mite was apparently biologically active, but not clinically therapeutic in the above study. Thus, the conclusion that homeopathically-prepared remedies are “just placebos” is incorrect, as they are not necessarily biologically inert even when prescribed in a non-classical manner with a non-therapeutic result.

Global and local aspects of a complex network system are mutually interactive and influential.<sup>155</sup> Similarly, a remedy has the overall potential to trigger a wide range of global and local specific changes in an individual, but it is very difficult to predict precisely which changes will occur when and with what intensity or duration. Nonetheless, in a complex network, the system has more influential hubs (highly connected and impactful points) and less influential nodes.<sup>156</sup> Hering’s Law of Cure maps well onto the notion that a human being, as a nonlinear dynamical hierarchically self-organizing complex system, will change in response to a remedy stimulus in accord with how globally and locally a treatment can act (from above downward, from inside outward, in reverse order of time of original symptom appearance).

As classical homeopaths have observed, it is essential to choose a remedy that matches the deepest and most pervasive disturbance throughout the person to mobilize the most extensive change and healing. If a clinician ignores the generals and mentals and aims treatment at too low an organizational level of the person (e.g., a specific physical symptom), then the shift in disease dynamics could move anywhere else within the system to other hubs and nodes connected to the treated local node, including into more important organs (suppression). Complex network theory is consistent with this model.<sup>119,155,156</sup>

The ideal remedy addresses the patient’s physicals as well as the generals and mentals precisely because of the self-similar expression of the disturbance across all levels of the human being. Thus, a suppressive treatment might improve complexity of local target organ dynamics (e.g., relieve skin symptoms) at the cost of triggering lost complexity and excessively rigid dynamical order at higher levels of system organization (e.g., initiate depressed mood). The true advantage of classical homeopathy is its ability to disrupt disease dynamics and redirect the self-similar global and local system dynamics simultaneously to reorganize across all levels of network organization toward healthier patterns (see summary concepts – Table 1).

[INSERT TABLE 1 ABOUT HERE]

### **Emerging Research in Basic and Preclinical Science**

The elephant in the room for homeopathy has long been the implausibility argument, i.e., that the remedies diluted beyond Avogadro’s number (e.g., 12c and above) have no remaining source molecules and thus cannot exert specific biological activity.<sup>157,158</sup> This flawed molecular argument derives from incorrect assumptions that high school chemistry is the only science relevant to homeopathy. Although molecular composition is one way to describe an agent, it is not the only one. The key to homeopathic remedies may lie not in their molecular composition, but rather, in the dynamical network structure of the solvent molecules in which they are prepared.<sup>159-162</sup>

Remedies begin with material source substances. However, remedies are not only diluted in solvents, typically ethanol-water mixtures; they are succussed. Succussion generates tremendous amounts of turbulence and pressure changes in the liquid solvent. Pressure changes can produce nanobubbles and persistently modify the organizational network structure of a liquid phase solvent even at room temperature.<sup>159,160,163</sup> In solid phase, pressure changes can produce

very different materials; for example, soft graphite and hard diamond are both different structural organizations of the same molecular composition, i.e., carbon, generated by differences in pressure. Succussion can also produce dispersed colloids or sols (which are not solutions); and marked changes in pH can disrupt colloids (see below). Papers by Roy et al.,<sup>159,160,163</sup> Chaplin,<sup>162</sup> Elia et al.,<sup>164-166</sup> and Rey<sup>167,168</sup> detail rigorous scientific arguments and empirical data that refute the molecular composition hypothesis offered by skeptics of homeopathy.

The experimental evidence supports a different hypothesis – that is, that the solvent for homeopathically-prepared remedies involving both dilution and succussion has unique physicochemical properties. The techniques that are demonstrating unique homeopathic remedy properties include calorimetry,<sup>169</sup> thermoluminescence,<sup>167,170</sup> Raman spectroscopy, and UV-vis spectroscopy,<sup>160</sup> but not NMR<sup>171</sup> or infrared spectroscopy.<sup>160</sup> The data indicate that remedy preparation produces an increase in the organized order of the solvent molecules, as distinguishable from unsuccessful dilutions and remedy source-free succussed solvent controls. Treating a remedy with an extreme change in pH or x-ray leads to release of greater amounts of energy from the remedy liquid than from controls. The energy release reflects disruption of order in the structured water and ethanol solvent molecules. Some researchers propose that the order derives from dynamically-shifting hydrogen bonds between water molecules,<sup>167,168</sup> and others suggest that weaker van der Waals forces<sup>159</sup> may be in play. It also appears that silicate contaminants from the walls of glass containers may help stabilize homeopathically-prepared remedies in liquid phase, but do not, in and of themselves, account for the unique properties of one remedy compared with another.<sup>172</sup>

Much more basic science research is needed, but researchers are finally on their way to unraveling the nature of homeopathic remedies. The convergence of findings from several different laboratories around the world using several different types of technology makes the validity of the conclusions more believable than when only one research group claims findings with only one technology.

The calorimetry research group has reported a particularly striking observation that needs replication using the same and other technologies in independent laboratories. That is, Elia et al.<sup>166,173</sup> find that the amount of heat released in calorimetric measurements when they disrupt the pH of a homeopathic remedy with a strong alkali in a test tube increases with the passage of time. Most molecular-based drugs lose their potency sitting on the shelf, but Elia's group reports that re-testing a remedy left on the shelf for months often strengthens the findings. If verified, remedies appear to be seeding their own formation in the solvent at rest, at room temperature, that is, evolving over time. This observation could have implications for how a remedy acts in a living system.

Do remedies seed water “cluster” formation throughout the body water and thereby broadly affect function? Water is a hub molecule in most biochemical networks.<sup>156</sup> Water also plays an essential role in the structural configuration of proteins in the cells of living systems.<sup>174-177</sup> Some investigators have proposed that water clusters are necessary for keeping the cell's proteins properly folded (organized) for their functional roles.<sup>175</sup> This is one of several possible models for how a remedy could act,<sup>178-181</sup> though other work by del Giudice et al.<sup>182-185</sup> suggests a role for electrodynamic effects of homeopathically-prepared remedies in water solvent. Still other investigators have invoked macro-entanglement and other quantum mechanical phenomena in the ability of remedies to induce the dramatic and extensive changes in health that homeopathic patients can report.<sup>130,186-188</sup>

Clearly, researchers have more work ahead,<sup>189</sup> but it is likely that the processes that homeopathic remedies invoke to induce shifts in living system function are different from allopathic molecular pharmaceutical lock-and-key drug-receptor interactions. Other research evidence in the literature demonstrating effects of homeopathically-prepared remedies on biological systems in test tubes (in vitro)<sup>190-194</sup> and in animals (in vivo)<sup>195-206</sup> provide a limited, but important, foundation for the evolution of understanding of when and how remedies work. One

practical result of the basic science work could be to improve quality standards for homeopathic remedy manufacturers who currently can only test for unwanted contaminants with conventional tools, but not for the remedy activity itself. Other research studies can help resolve clinical debates, such as what factors do and do not antidote remedy effects.<sup>206</sup>

### Conclusions

The current value for doing homeopathic research encompasses at least three major areas: (1) to optimize clinical management and care of patients; (2) to expand our understanding of nature and healing; (3) to use better-designed studies with good external and internal validity for testing homeopathy in patients with various conditions and identify who should and who should not use homeopathy. In conventional medicine (allopathy), clinicians and researchers have a division of labor of sorts. Most medical doctors have little formal training in research methods and do not want to perform scientific studies themselves. Other MDs and many PhDs choose career paths focused on research in academia and in industry. Nonetheless, allopathic medical schools expect the clinicians they graduate to be informed professional consumers and critics of the published research literature.

As part of the maturation of contemporary professional homeopathy worldwide, it is time for the educational organizations in the field to focus not only on developing good clinical providers, but also clinicians who can intelligently understand and critique the relevant research literature beyond case reports and provings. Again, this does not mean that homeopathic clinicians must become independent researchers. Homeopaths simply need to know how to argue the case for and against their own field scientifically and to think about the implications of new findings for their clinical practice, in an up-to-date and rigorous manner. Beyond becoming informed professionals, some homeopaths also may want to form or join practice-based research networks in collaboration with academic researchers.

The field also needs concerted efforts to develop and cultivate a critical mass of dedicated researchers, institutions where they can work (both academic and private foundations), and funding sources to support more studies advancing homeopathy. One of the many lessons of the Flexner report in the U.S. for homeopathy in retrospect should be that science, beliefs based on world views, politics, and economics are intertwined in human society. Science in the real world is not an idealized ivory tower of pure inquiry,<sup>207</sup> and skeptics are often using the results of scientifically-flawed studies to attack homeopathy on what they consider to be “scientific” grounds.<sup>158</sup> Homeopaths must be prepared to critique positive and negative studies on the basis of methodology rather than ideology and to debate the implications of a given set of findings in context of the rest of the research literature.

If homeopathy constitutes a threat to the beliefs and/or economic interests of the politically dominant allopathic system of care and the pharmaceutical industry with which it is tied, it is naïve to expect allopathic research institutions to support or encourage homeopathic science.<sup>208</sup> For the survival and growth of the field, it is time for homeopaths and their supporters to face the latter reality and take action accordingly. The potential for enormous progress in understanding what homeopathy has to teach us about health, disease, healing, and the nature of reality is palpable.<sup>209</sup> Science is one path for making such progress – and now, it offers homeopathy an array of new methodological tools that allopathic medicine has largely overlooked as unnecessary to study pharmaceutical drugs. Homeopathic remedies are something remarkable (perhaps with strange and peculiar, but not necessarily rare properties), and they are not pharmaceutical drugs. This is our challenge and our opportunity.

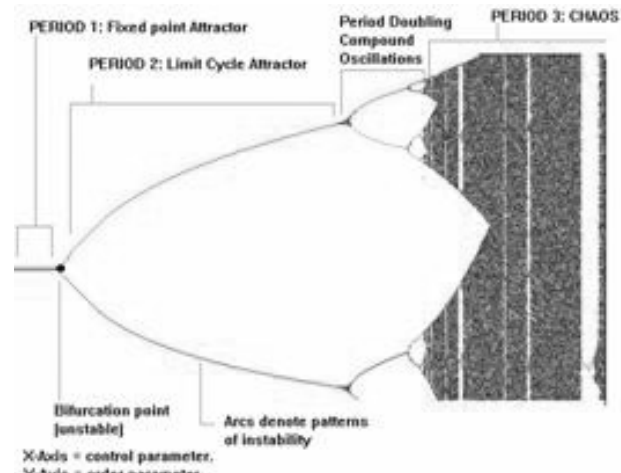


Figure 1. The logistic map is a simple quadratic function with the special property of describing the change in a system from a fixed point attractor [corresponding to a rigid, stuck, unhealthy dynamical process], to a periodic attractor, to chaos as a bifurcation variable increases in value. It originated in studies of population dynamics. [Excessively frequent remedy repetition may cause incurability by pushing the system dynamics to bifurcate excessively and end in chaos]. (Source: <http://www.societyforchaostheory.org/tutorials/#1> , accessed 4/27/08)

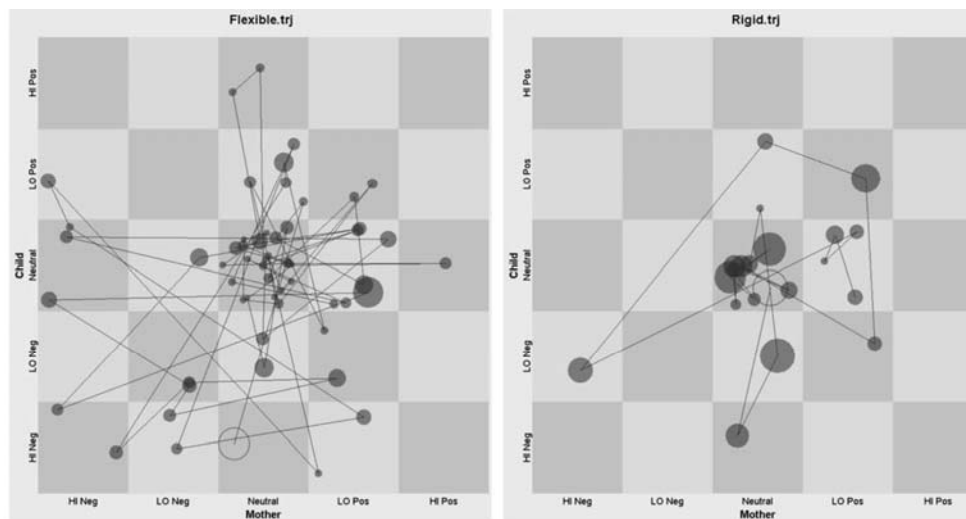


Figure 2. State space grid method examples of a relatively flexible mother-child interaction (left)[healthier dynamics] and a relatively rigid one (right)[unhealthy, repetitive/stuck dynamics], coded by research observers from videotaped behaviors. Mother behavior is plotted on the x-axis and child behavior on the y-axis. Two different behaviors exhibited in real-time by a single individual can also be plotted with this method (Source: Hollenstein 2007, reference 140, used with permission).

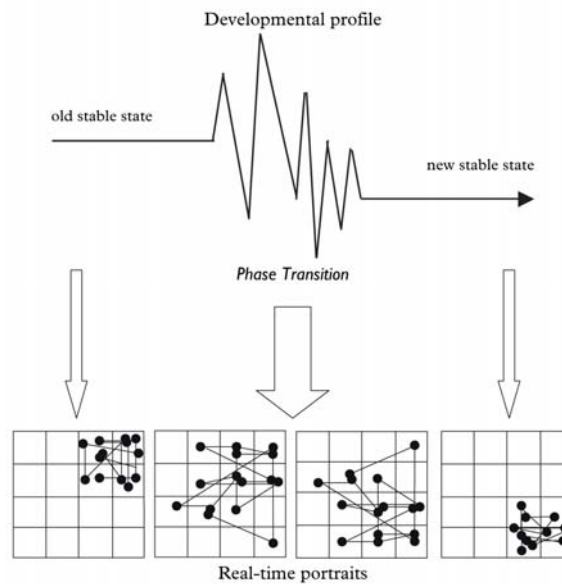


Figure 3. Schematic diagram of the relationship between real-time variability and a phase transition in developmental time [compare the possible evolutionary system dynamics of a chronic disease state at the time of remedy administration (far left), through possible aggravation, destabilization, and dynamical self re-organization during a phase transitional treatment period [middle two grid portraits], and restabilization into different, dynamics after treatment [far right]. The new attractor pattern will be different from the original attractor, perhaps healthier (more flexible) or less healthy (more rigid), depending on the success of the treatment (Source: Hollenstein 2007, reference 140, used with permission)

Table 1. Summary of overlaps between homeopathic and dynamical systems concepts

<b>Homeopathic Concept</b>	<b>Dynamical Systems Research Concept</b>
Disease states/remedies and health express themselves through unique patterns of symptoms (behaviors)	Attractor patterns – rigid (stuck), flexible (resilient)
Small doses produce big effects	Nonlinearity
Timing of intermittent dosing when remedy picture stabilizes (or begins to reverse toward disease state)	Sensitive dependence of system response on initial conditions
Aggravations and reversals in direction of illness trajectory	Phase transitions, bifurcations, and cusp catastrophe events
Removing obstacles to cure	Fitness landscape within the environment
Hering's Law of Cure	Self-organization

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**Dr. Iris Bell** is Professor of Family and Community Medicine, Psychiatry, Psychology, Medicine (Program in Integrative Medicine), and Public Health at the University of Arizona in Tucson, Arizona. She is licensed in homeopathy and allopathic medicine in Arizona. An interdisciplinary researcher, she has published over 100 scientific papers and two dozen book chapters on her work. Her recent homeopathic studies have been funded by the National Institutes of Health, including career grant K24 AT000057. She also consults for Standard Homeopathic/Hyland's Inc. Her forthcoming book for consumers is *Getting Whole, Getting Well: Healing Holistically from Chronic Illness* (Morgan James Publishing, 2008), [www.holisticmedicinetips.com](http://www.holisticmedicinetips.com)  
[ibell@u.arizona.edu](mailto:ibell@u.arizona.edu)