

# Research

## VITALITY AND QUALITY AS SEEN THROUGH Picture Forming Methods

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**T**HE BIODYNAMIC ASSOCIATION took another step in support of biodynamic research<sup>1</sup> this November 18-22 in Chicago, together with the Natural Science Section of the School for Spiritual Science in North America. Sarah Weber, of the BDA's Biodynamic Research Program, joined fellow researchers, farmers, "prep" makers, physicians, and others for a conference on the theme "Vitality and Quality as Seen Through Picture Forming Methods: Bridging the Polarity of the Analytical and the Imaginative in the Evaluation of Food, Soil, and Water."

The Picture Forming Methods (PFM) set up experimental conditions that are sensitive to inherent properties of biological extracts or water samples. Resulting patterns—be they formed by evaporative crystallization on glass, capillary action in filter paper, or flow patterns of pure water over sample-containing glycerin solution—serve as "sensitive images" to be "read" qualitatively, with the aim to differentiate comparative samples or to investigate their vitality (or "etheric" qualities).<sup>2</sup>

The PFM are much more widely used in Europe, and even Turkey and India. They are used in biodynamic circles for Demeter certification and in anthroposophical medical institutes for quality assessment of medicaments. For over fifteen years an association of practitioners has

met annually in Europe, furthering the methodologies and establishing EU norms according to ISO standards for such practical applications as distinguishing biodynamic, organic, and conventional products.<sup>3</sup> The Biodynamic Association has been eager to bring together people working with the PFM here in North America, in a similar way.

### Dr. Maria Olga Kokornaczyk

We were very pleased to have Dr. Maria Olga Kokornaczyk with us from Europe. Maria Olga introduced the Droplet Evaporation Method (DEM) for assessment of food products and ultra high dilutions in the laboratory of Professor Lucietta Betti, who studies homeopathic treatments in agriculture at the University of Bologna. In addition to more typical sources, Weleda Italy, Demeter Italy, and the Italian Biodynamic Association all contributed funding to support this research. Maria Olga is now at Iscador AG with Dr. Stephan Baumgartner in Arlesheim, Switzerland.

Thursday evening, Maria Olga gave a public presentation surveying the various established PFM, applying three criteria: (i) the method creates patterns, (ii) the patterns are used for holistic analysis, and (iii) the method is described in at least one peer-reviewed publication. The Copper Chloride Crystallization Method (CCM), Capillary Dynamolysis Method (CDM), Pfeiffer Circular Chromatography Method (PCM), and Drop Picture Method (DPM) were developed by anthroposophical researchers. The Droplet Evaporation Method (DEM) is covered widely in the scientific literature, as variations are also employed in nanotechnology and materials science (as in developing your inkjet printer).

Wednesday afternoon, Maria Olga had presented an initial study, not yet published, which utilized PCM on soil samples from fields under different management and different crops, in comparison with standard chemical analyses of the same samples. The "chromas" were analyzed by evaluation groups, which visually ranked



Research by Dr. Walter Goldstein (see p. 48) of the Mandaamin Institute, with USDA-ARS breeding lines/inbreds on left and Mandaamin N efficient hybrids on right

specified characteristics, and by computerized image analysis for an “entropy value.” These results of these two types of analysis were in agreement.

The analyses of the resulting PCM “chromas” brought forth an interesting correlation with the corresponding soil analyses. Radial elements in the PCM pattern, possibly the result of flow ducts forming in the paper and particle size differentiation and deposition, correlated with higher soil organic matter, total nitrogen, and the sandier soils. Concentric elements, perhaps related to precipitation products as in conventional separation chromatography, correlated with higher pH and the silty clay soils with lower organic matter content.

Friday morning into the afternoon, Maria Olga delivered a *tour de force* on her work with the DEM in Bologna. She started the morning by describing her 2008 doctoral thesis. Utilizing CCM, significant differences were found between three varieties of wheat grown by either organic or conventional means, employing image analysis of the middle region of the CCM biocrystallogram.

The self-organizing pattern formation observed in both CCM and DEM has to do with evaporative crystallization. CCM involves a broad concave meniscus, starting its more or less two-dimensional crystallization in the middle area of the dish, whereas DEM involves a very convex meniscus, drying from the periphery of the droplet inward.

CCM images are all broadly similar dendritic crystallization patterns amenable to standardized evaluation methods, whereas DEM crystal forms vary between sample types and may include non-crystalline agglomerations and residues, necessitating the invention of evaluation methods particular to each sample type. Yet DEM requires only one drop of sample (about 3 microliters), whereas five to six milliliters are needed for CCM. And drying time is only about forty-five minutes, versus fifteen to eighteen hours for CCM.

Maria Olga then described DEM experiments using wheat grain “leakages” (i.e., substances pass into ultrapure water during one hour soaking of the kernels).<sup>4,5</sup> DEM patterns underwent visual evaluation with reference pictures of increasing complexity (as per CCM protocols), as well as objective measures by image analysis of local connected fractal dimension (LCFD) and fluctuating asymmetry (FA). LCFD characterizes local variation of image complexity and FA is a measure of approximate bilateral symmetry of crystal patterns. There was strong agreement among these three evaluation methods.

Results from these studies, comparing the wheat cultivars, showed that greater complexity and symmetry of their DEM patterns correlated with greater vigor on germination tests. This simple and rapid PFM may prove use-

ful not only for such on the spot seed vitality assessment, but perhaps with suitable adaptation it may be applied in food quality assessment more generally.

Especially fascinating were Maria Olga’s studies applying DEM to assess the effectiveness of ultra-high dilutions (UHD) in an “isopathic model,” whereby seeds are stressed with a poison and then treated with an UHD of the same poison, looking for recovery from the stress.<sup>6</sup>

First, wheat grain leakage from unstressed seed was compared to that from seed previously stressed with a mild solution of arsenic trioxide. In an *in vitro* growth test,

## Picture Forming Methods

Images form in the **Drop Picture Method (DPM)** in a dynamic series after every one of forty drops of ultrapure water strike the surface of a glycerin solution which incorporates the sample. The percussive action of the drops sets up flow channels and vortices in rosette patterns.

There are two methods utilizing capillary action. In the **Pfeiffer Circular Chromatography Method (PCM)**, extracts are absorbed from a central wick through horizontal filter paper previously impregnated with a silver nitrate reagent. In the “rising picture” or **Capillary Dynamolysis Method (CDM)**, on the other hand, the silver nitrate reagent rises up through a cylinder of filter paper previously impregnated with the sample extract, followed yet again by an iron sulfate reagent to “fix” the silver products, as with photographic “developer.”

There are also two evaporative crystallization methods. In the **Copper Chloride Crystallization Method (CCM)**, sometimes called biocrystallization, extracts mixed with a defined copper chloride solution are allowed to slowly evaporate in a flat dish under controlled conditions, yielding a crystallization pattern image. In the **Droplet Evaporation Method (DEM)**, individual sample droplets are allowed to evaporate directly on a slide, and the resulting crystal patterns are examined under a microscope.

To see visual examples of these methods and read more on the topic, visit [www.biodynamics.com/picture-forming-methods](http://www.biodynamics.com/picture-forming-methods), where more information will be posted by [June 1](#).

this poison treatment resulted in a significant decrease in shoot length for the stressed seeds. Correspondingly, DEM patterns were also greatly diminished in leakages from stressed seeds for both LCFD and FA measures.

Then, according to the isopathic model, both stressed and unstressed seeds were assessed following treatment with a 45X UHD of the arsenic trioxide. This dilution level is beyond the Avogadro limit; the likelihood that any molecules of the original substance are still present is close to nil. Therefore, biological activity according to the conventional “molecule-receptor” paradigm is highly unlikely.

UHD treatment had a mild stimulating effect upon unstressed seed, yielding somewhat increased shoot length over control. LCFD and FA measures of DEM patterns were correspondingly enhanced.

UHD treatment of *poison-stressed* seed showed “isopathic sensitization,” as seen in previous studies. That is, normal growth was not fully recovered by this stimulation effect, but shoot length was significantly increased relative to stressed seed *without* UHD treatment. Moreover, DEM patterns after isopathic treatment resembled patterns from normal, unstressed seed and yielded LCFD and FA measures of polycrystalline structure, which were correspondingly enhanced to a significant extent.

Finally, Maria Olga spoke of some intriguing work with DEM leading to a preliminary hypothesis regarding lunar effects affecting crystallization patterns.<sup>7</sup> It was noticed that, across 720 patterns from wheat seed leakages developed on six separate days, LCFD measures correlated strongly with the moon’s height, phase, and distance from Earth. Since these moon phase data correlated strongly between each other, more experiments should be done to disentangle these potential influences.

### Jennifer Greene

On Saturday morning, Jennifer Greene, from the Water Research Institute of Blue Hill, Maine, took the stage. From workshops and courses, many of us know Jennifer’s enthusiasm for water quality, fluid phenomena, and the DPM. The main research question of this method is: “What makes good water good, after you have taken everything bad out of it?” How do we assess samples that are of “good quality” when there are no objectionable elements within the sample? She pointed out early on that whatever makes good water good, we are certainly good at *using* water: everything from sacrament to research, from nutrient to waste stream.

She illustrated for us how water makes “movement” forms when it moves, as in trains of vortices or meandering rivers—even how there is a “fluidity” behind organ and geological formations. The attractive quality of such

intrinsic properties of water moves peoples’ souls. The premise of Jennifer’s work is that experiencing such phenomena changes peoples’ hearts about water—both laypeople and professionals—and leads them to change their water management attitudes and practices.

The DPM she practices was developed by Theodor Schwenk, author of *Sensitive Chaos*. Working at Weleda with capillary dynamolysis, questions of water quality arose. Schwenk realized that he needed to understand the *Being* of water. Weleda helped him found the Institute for Flow Sciences, and he began to explore fluid phenomena. Theodor’s son, Wolfram Schwenk, put the science behind the method to optimize the experimental parameters for sensitivity, such as the specific glycerin concentration of the sample-bearing solution (viscosity), the drop height, size and weight, temperature, etc.

Forty drops fall 10.5 cm onto the surface of a sample-containing glycerin solution filling an optically-correct glass dish to a specific height, one every five seconds. Three seconds after impact of the drop, the image settles, leaving only a couple seconds for qualitative assessment during each drop of the series. The sample consists of 2.5 ml of pure glycerin and 17.5 ml of water sample. The flow each time is generated through the impact of the drop of ultra-pure water on the surface. The image is made visible through a system called Schlieren optics. One needs be attentive and “in the movement,” even for video playback.

We were shown a set of drop series for different types of samples. One dramatic example was to see the flattening effect—a deadening of vortex forms and loss of vitality—due to a certain tensid surfactant. Wolfram was a limnologist, concerned for polluted lake and river waters. Work at the Institute in Herrisried contributed to a policy banning that particular surfactant in Europe. Sensitive imaging of the effect of such surfactants in parts per trillion helped led to the development of alternative, environmentally friendly soaps, which are now on the market worldwide.

### Dr. Walter Goldstein

Dr. Walter Goldstein addressed us on Thursday afternoon. Walter had tried some CCM studies while an undergraduate student at the University of Washington. He had further exposure to the CCM method while working as a research intern at the Scandinavian Research Council in Järna, Sweden, and then used the PFM while doing research at Emerson College, Forrest Row, England.

But Walter preferred to speak to us rather of one of “nature’s PFM’s”: reading the life and vitality of the soil that feeds us all. He described some of the “readings” he has made using the “instruments” of his own senses and a shovel. For instance, as Steiner spoke of the ethers



being reflected back towards the earth's surface in winter, Walter observed that the soil seemed to aggregate and fill with life quality from below upwards in November. Such re-vitalization depended on adequate manuring of the soil and seemed to be critical during the next growing season for sustaining root health and for growing quality crops, as reflected in taste and keeping quality. Plants grown with synthetic nitrogen fertilizer appear to rot more quickly than do crops grown with compost and biodynamic preparations.

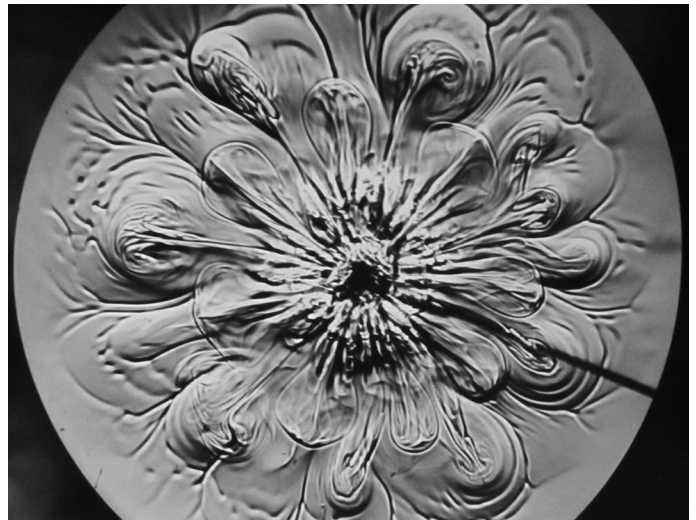
Walter has tried at times to “read” soil quality and root health by excavating and examining roots of field crops. Perhaps the ultimate bioassay he found was in a large survey done on root health with corn grown on organic and conventional farms in Wisconsin, Iowa, and Illinois. Though conventional farms had on average almost twice the root disease as organic farms, there was considerable variation amongst the alternative farms. The long-time biodynamic Zinniker Farm in Wisconsin had the healthiest corn roots—even the seminal root remained alive and healthy at flowering time, while on all other farms the seminal system was dead.<sup>8</sup>

Walter then described pilot efforts by the BDA to establish a Quality Testing Network.<sup>9</sup> Such a network might assess soil vitality and root health, do organic matter budgeting, conduct feeding preference tests, and provide PFM evaluations.

A consortium of the BDA, the Bionutrient Food Association, Cornell Cooperative Extension, Cornell University, and Walter's Mandaamin Institute, planted crops of corn and carrots in 2014. By harvest time, funding didn't materialize and resources were limited, so results were only preliminary. Despite that, interesting differences were found between farms in the keeping quality of the carrots. It is hoped that such a network will eventually become an active reality to which farmers and processors can turn for services.

Walter closed by telling us the more upbeat story of his corn breeding work at the Mandaamin Institute.<sup>10</sup> Mandaamin means “wonder seed” in the Algonquian language. The intent of the Institute's work is to enhance the quality traits of corn and to combine those traits with adequate yields. Walter spoke about modern directions in breeding, including genetic engineering and dihaploid breeding, and about a growing realization in the scientific community of the complexity and dynamic nature of inheritance, self-regulation, and adaptation. By more carefully observing changes in populations, breeding lines, and “finished” inbreds, Walter is discovering emerging traits that are important for enhancing food nutritional value.

Organic poultry growers are currently allowed synthetic methionine as a feed supplement, since con-



Observing the fluid patterns forming on bubbles; a drop picture telling the “story” of spring water; an exercise in drawing vortices



Hands-on exercise making rising pictures  
(Capillary Dynamolysis Method, CDM)

ventionally-bred organic feed grains no longer provide enough. Walter has varieties of corn with an adequate content of the amino acid and generally a higher quality protein composition. He is also breeding corn that will prevent cross-contamination by genetically-engineered pollen—a very serious problem for organic corn growers.

In 2009, Walter discovered nitrogen-fixing corn among Mexican and South American landraces.<sup>11</sup> Endophytic diazotrophic bacteria live in the stems, roots, and leaves and proliferate in brace roots, which weep a rich exudate that supports the symbiotic relation. These plants appear to access more nitrogen than normal varieties under conditions where nitrogen from the soil is limited. Even in poor soil, these plants thrive. Walter is currently working to further adapt his breeding lines with their excellent protein quality to Midwestern conditions. This is a very exciting development, arising from a breeding approach which uses conventional methods, but adds to them careful observation and ways of practicing partnership with the crop.

#### Dr. Ross Rentea

Another laboratory in the Midwest is also doing groundbreaking work deserving our support and attention. Thursday morning, Dr. Ross Rentea told us of practices initiated at the Lili Kolisko Institute for Anthroposophical Medicine.<sup>12</sup> Working on a potentized remedy for hoof and mouth disease in 1920, Rudolf Steiner suggested that Lili Kolisko, originator of capillary dynamolysis, let seeds sprout in different dilution levels of the remedy in order to get a growth curve, indicating the greatest potency. Together with his wife, Dr. Andrea Rentea, and Dr. Mark Kamsler, they are employing this plant germination paradigm in order to validate the potency dilutions of their True Botanica medicaments.<sup>13</sup> Such potency curves can reveal a rhythm of varying effect, which may include inhibition and null points, as well as stimulation points, to be used as appropriate for a particular diagnosis.

#### Conclusion

Laboratory capacity for PFM quality testing in the States already exists at the Kolisko Institute, Mandaamin Institute, Water Research Institute, and now at the Nature Institute.<sup>14</sup> But, as yet, we don't have the Demeter producer-processor-consumer base to support research funding as in Europe. It would also be helpful if interested graduate students could find sympathetic mentors in research universities here, as are found in the more open-minded scientific culture of Europe. We have yet to tap into our growing quality-conscious food culture and craft a Quality Testing Network for the Americas.



This meeting made its contribution to galvanize PFM in North America. Bruno Follador, from the Nature Institute, and Dr. Barry Lia, Science Section member, also both brought PFM work to the recent Fellowship of Preparation Makers meeting in California this February.<sup>15</sup> It is to be hoped that the BDA and other groups can build further fruitful collaborations.

Throughout the days of our meeting, over delicious meals mustered by Andrew Linnell, informal conversations carried on where lively formal discussions had left off. Barry Lia led us in hands-on exercises making rising pictures (CDM pictures), using as an extract for study the coffee we drank. To enhance this experience, he then led a set of exercises based on Jochen Bockemühl's discussion of four modes of observation corresponding to the four ethers.<sup>16</sup> For the warmth ether, that group of participants were wordlessly to "be" the story that the rising pictures told. You should have been there when it finally dawned on us watching them that Walter Goldstein and Dewane Morgan were miming conventional and biodynamic coffee plants growing and being sprayed and tended by the others and then harvested, ground, and brewed before rising up an imagined sheet of paper. It was a hoot!

This light-hearted artistic exercise was ultimately intended as a way to embody, in part, the more serious intent of our conference, for participants to *become sensitive* to the whole context behind the formation and interpretation of the "sensitive images" of such Picture Forming Methods as are applied in medicine and biodynamics.

## NOTES

- <sup>1</sup> <https://biodynamicsbda.wordpress.com/2010/06/17/gathering-of-biodynamic-researchers>, as retrieved April 7, 2016.
- <sup>2</sup> E.g., Lia, V. (2004). "Annette Tingstad's *Quality and Method: Rising Pictures in the Evaluation of Food Quality*." *Biodynamics* 250:28-29.
- <sup>3</sup> For example, a series of papers published in the journal *Biological Agriculture and Horticulture* Vol 27:1 (2010).
- <sup>4</sup> Kokornaczyk, M., Dinelli, G., et al. (2011). "Self-Organized Crystallization Patterns from Evaporating Droplets of Common Wheat Grain Leakages as a Potential Tool for Quality Analysis." *The Scientific World Journal* 11:1712-1725.
- <sup>5</sup> Kokornaczyk, M., Dinelli, G., and Betti, L. (2013). "Approximate bilateral symmetry in evaporation-induced polycrystalline structures from droplets of wheat grain leakages and fluctuating asymmetry as a quality indicator." *Naturwissenschaften* 100:111-115.
- <sup>6</sup> Kokornaczyk, M., Trebbi, G., Dinelli, G., et al. (2014). "Droplet evaporation method as a potential ap-

proach for highlighting the effectiveness of ultra-high dilutions." *Complementary Therapies in Medicine* 22:333-340.

- <sup>7</sup> Korkornaczyk, M., Baumgartner, S., Betti, L. (in press). "Polycrystalline structures formed in evaporating droplets as a parameter to test the action of *Zincum metallicum* 30c in a wheat seed model." *Homeopathy* doi:10.1016/j.homp.2015.10.002
- <sup>8</sup> Goldstein, W. (2008). "Boden, Wurzeln, Präparate." *Lebendige Erde* 6/08:44-48. Retrieved April 7, 2016 from [http://www.lebendigeerde.de/index.php?id=heft\\_2008\\_6&L=0](http://www.lebendigeerde.de/index.php?id=heft_2008_6&L=0)
- <sup>9</sup> <https://www.biodynamics.com/content/program-activities>, as retrieved April 7, 2016.
- <sup>10</sup> <http://www.mandaamin.org>, as retrieved April 7, 2016.
- <sup>11</sup> <http://www.mandaamin.org/about-nitrogen-fixing-corn>, as retrieved April 7, 2016.
- <sup>12</sup> <http://www.koliskoinstitute.org/about-us/who-we-are/>, as retrieved April 7, 2016.
- <sup>13</sup> <http://www.koliskoinstitute.org/kolisko-validation-process/>, as retrieved April 7, 2016.
- <sup>14</sup> <http://www.natureinstitute.org/soil/index.htm>, as retrieved April 7, 2016.
- <sup>15</sup> <http://www.bdanc.org/events/>, as retrieved April 7, 2016.
- <sup>16</sup> Bockemühl, J., Lindenau, C., Maier, G. (1996). *Toward a Phenomenology of the Etheric World*. Great Barrington, MA: Steiner Books.

Together with his wife, Janet, **Barry Lia** has been practicing biodynamic husbandry on their urban homestead in Seattle for twenty-five years. Lia completed a two-year biodynamic training with Dr. Andrew Lorand, has a Ph.D. in neurobiology, and runs Lia BD Consulting. He is also active at S&S Center for Sustainable Agriculture and Homestead Farm and at Jubilee Farm. In addition, Lia distributes the Washington biodynamic email list, serves as the Northwest regional coordinator for NABDAP, and is a member of the Agriculture Section, the Science Section, and the BDA's Biodynamic Research Working Group. Lia serves as adjunct faculty for the Holistic Landscape Design certificate program in Botanical Medicine at Bastyr University.



Photos courtesy of Walter Goldstein (p. 46), Andrew Linnell (p. 49), and Sarah Weber (p. 49-50)