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Excerpts from the Leader's Guide for

Leadership and the New Science

A Synopsis of the CRM Video

**A Perspective:
Lessons from the New Science**

Perspective: An Exercise

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SYNOPSIS OF THE VIDEO

The video opens on the familiar stressful scenes from modern work life as the narration reminds us that “chaos,” which we are supposed to be managing, is somehow managing us. An abrupt transition to a natural sequence of beautiful clouds and streams interjects the theme of the video—while order may seem elusive in our work lives, it is abundant in the natural world. We are introduced to Dr. Margaret Wheatley, an Associate Professor of Business and author of the book **LEADERSHIP AND THE NEW SCIENCE**, and she begins to share with us a wide spectrum of insights that she has gained in her study of such diverse fields as physics and biochemistry. She points out that structures in nature, clouds and streams, for example, are “self-organizing.” That is, they shape themselves functionally rather than through dogmatic adherence to a preconceived structure. Miraculously, they still fulfill their function remarkably well. “What might be the structure of an organization that would allow it this same flexibility?” she asks. Looking deeper into recent discoveries in the “new sciences”—chaos theory, evolutionary biology, quantum mechanics, and field theory Wheatley focuses upon applying these discoveries in provocative ways to organizational life.

Order and Chaos

The video explores science's quest to provide scientific predictions of the weather. The quest failed but it shed light on a brand-new science, now called “Chaos Theory,” and in the process literally reshaped physics and a number of other sciences by redefining what is meant by “order” and “disorder.”

We see how, in nature, order is not imposed from without, but develops naturally from within. Wheatley then goes on to explain how, in our organizations, what may appear chaotic and disorganized may well be viewed as simply a manifestation of a very-natural transition to a new evolutionary state for the organization itself. For that reason, she states, we should not resist it, or try to shut it down “Chaos,” she says, “is just one of the ways in which Nature creates new levels of order, new levels of understanding.”

Information

New advances in biology are casting new light on our understanding of the role that genetic information, DNA, plays in life. As we see remarkable footage of the genetic code of life, we learn how many scientists in the new area of evolutionary biology now consider living things as really just information that has taken material form. Information is now seen as one of the primary organizational forces in the universe. We have viewed life as “creating” information, when in fact it is information that is “creating” life. Wheatley reflects upon how our traditional view of information has had significant impact upon our organizational philosophies, where

information is closely guarded and secretively-managed as the hallmark of power rather than allowed to flow freely for its organizing properties.

Relationships

The video moves next to quantum mechanics, where the search for the nature of light has been a decades long search—is it a particle? Or is it a wave? Recent advances in science indicate a remarkable fact; it is *both*, depending upon what sort of relationship it is in. In organizations, Wheatley explains, this simple insight from science has profound implications. By illuminating our view of ourselves as workers—the “atomic particles” of the workplace—we learn that, like light, we are described best as what we are in our productive relationship with others.

Vision

Finally, the video investigates “fields” in nature, such as gravity, which are invisible and yet whose effects can be felt in every living thing. An experiment to explore the cause of the Aurora Borealis, or northern lights, is demonstrated—scientists on the space shuttle Atlantis fire into the earth's upper atmosphere a beam of electrons, which then interacts with the earth's magnetic field. This produces a shimmering display of auroras, the first artificial ones ever created. In a similar way, the much-used and often-misunderstood term “vision” in organizations can be thought of as a field. The similarities are apparent: it refers to something invisible but which can have a broad and significant impact. And, like an aurora, when vision is everywhere understood in an organization and employees can interact positively with it, wondrous new forms of energy and productivity are created. The video ends with a powerful summary of key informational points recapped with stirring visualize and music, reflecting the brave frontier that lies before us all. As Margaret Wheatley says, “The only thing that works is for us all to be anxiously engaged in creating organizations of the future together.”

A PERSPECTIVE: Lessons From the New Science

By Margaret J. Wheatley, Ed.D.

During the twentieth century, and particularly in the last twenty years, the ways in which scientists understand the workings of the universe have changed dramatically. The new sciences of quantum mechanics, chaos theory, and evolutionary biology continue to startle us with images of life very different from the clockwork universe that has dominated scientific and popular thinking since the seventeenth century.

In the seventeenth century, the work of Sir Isaac Newton, Emil Descartes, and Sir Frances Bacon laid the foundations for the next three hundred years of technological progress. They established ideas and beliefs that most of us still hold dear—that the world is a great mechanism, a perfectly working clock or machine, and that we can best understand this machine by analyzing its parts and discerning the laws that make it work. One day, scientists hoped, we would understand its workings perfectly. Once we did, we would be able to predict everything.

Western science and everyday thinking have long been based on these seventeenth century assumptions. We manage; then, by breaking things into “parts” just look at any organization to see its functions, departments, and roles. We've created boundaries between everything and proscribed who does what. For many years, we've treated people like machines, assigning them specific roles and ignoring their other abilities, emotions, or beliefs. In creating all these separate “parts,” we left it to managers to integrate the pieces into a smoothly functioning machine.

But in turbulent times, no machine has the ability to change and flex as the environment shifts. Cumbersome bureaucracies and complex hierarchies simply don't work when things need to get done quickly in an environment that changes constantly. The challenge of our times is to invent and discover the organizational forms that can be as resilient, adaptive and healthy as most living organisms. How can we create organizations that don't get stuck in their own structures? How can we design work so that it gets -done with maximum efficiency and effectiveness, by people who feel good about what they're doing? How can we create organizations that thrive on change? These are the challenges of our times—the paradigm shift of which so many have spoken.

SHIFTS IN SCIENTIFIC AND ORGANIZATIONAL THINKING

Discoveries in science in the past few decades present a variety of new “lenses” by which to think about organizations. These sciences deal with the issues that are troubling our organizations: How do systems grow and change constantly? How do they retain an identity in the midst of change? How do they work with chaos, rather than resisting it?

Some dominant themes have emerged in many different branches of science. Woven together, these themes signal a profound shift in our understanding of the world and of our organizations.

Shift 1. From the parts to the whole.

As scientists are able to observe more and more of the universe, they have become sensitive to observing whole systems, rather than its pieces. They are now able to observe patterns, trends, and movement that were not discernible when only the parts were being studied. A similar shift is occurring in organizations where we view them as whole systems rather than as a collection of functions or units. Many organizations now define the boundaries of their system to include customers, suppliers and community members.

Shift 2. From understanding processes rather than structures.

In the past, scientists tried to understand the mechanisms, how the parts were structured to fit together. Now they look behind the structures to the processes, to the dynamics of a system that then give rise to certain structures. Attempts in organizations to redesign themselves by core processes reflect a similar shift. Instead of designing by traditional functions, more and more organizations are trying to discern the processes they need in- order to be responsive to customer and market demands.

Shift 3. To understanding that the universe is a web of relationships, constantly shifting and growing.

Instead of looking for hierarchies or building blocks, scientists now observe patterns of connections and dynamic interrelationships. These connections are much less hierarchical and have far more capacity to change than our older models. As organizations move into team or project structures, they are trying to design themselves as a web of skills, markets, and technologies, bringing all three together to respond quickly to new opportunities. Also in organizations, we are beginning to look much more seriously at the quality of our relationships—how good we are at working together across traditional boundaries of diversity ,background, and functions. Leadership is also changing, now viewed as a relationship between follower and leader, subject to change as conditions warrant. Much more attention is being given to what the leader needs to do in order to foster a strong relationship with others in the organization.

Shift 4. Towards the realization that we can never know reality absolutely, or predict anything.

Science has given up—Newton's quest for laws that would enable us to do exact predictions and realize that we live in a probabilistic world. Scientists now acknowledge that they cannot -predict

anything; approximations are the best we can hope for. This loss of certainty is affecting organizations' approaches to goal setting and strategic planning. How do we get a good approximation of what might happen, rather than rolling out a three or five year plan? How do we use individual skills to maximum effectiveness without getting locked into objectives or—fixed goals? How do we stay on course without aiming for a precisely fixed target?

UNDER THE LENS OF NEW SCIENCE

Like any new idea, we have to test how useful these new sciences are for helping us to think about our organizations. At their best, the lenses of new science may help us see things that weren't visible before. These new “glasses” are meant to provoke our thinking and to launch us on an inquiry that has only just begun. There are no easy prescriptions, no handy tools and techniques to pick up and carry off. Instead, these ideas urge us to become explorers and discoverers, eagerly engaged in inventing our organizations. In times of such radical change, we all have to work together to design an organization that works for us. We all need to think together in new ways, and be willing to support our joint experimentations. Perhaps this is the most profound paradigm shift—realizing that we all share expertise that is valuable for our organization, and that we have to work in new relationships and new processes in order to capitalize on our collective wisdom.

Order Found In Chaos

With the advent of high-speed computers, scientists have been able to observe chaotic or turbulent systems in new ways. The traditional definition of *chaos* is a system whose behavior is totally unpredictable; we can't tell what the system will do next. When scientists were only able to plot this chaos on simple graphs, all they saw was its unpredictability. People generally experience chaos this way; we complain of more and more uncertainty, craziness, and general feelings of being overwhelmed with the bombardment of events, changes and crises. But there is more to chaos than this unpredictability.

Strange Attractors

Using a three-dimensional “phase space” on computers, scientists began plotting chaotic systems in more depth and detail. What emerged on their screens were startling images of the order available in chaos. From moment to moment, the system was still unpredictable, but when observed over time, they saw that the system conformed to a boundary. While it was zinging everywhere in absolutely random ways, it never went outside of this boundary. Chaos has a shape, an order that is in the system, an order we are just now learning to see. These shapes, or patterns, are called “strange attractors,” objects, as one scientist described them, “of astonishing beauty of which we know so little.” These strange attractors reveal a profound paradox of chaos science: **chaos is order without predictability**. Most of us have never believed that order was

available independent of our ability to structure it into a system and to predict it. These attractors show us that order is inherent in the system; it emerges as the system moves and plays in its environment. If we only look at individual moments, at discrete activities or behaviors, all we can observe is unpredictability. But if we stand back and observe the system or the individual over time, what we see is a deep order woven into that behavior.

This is one of the dominant teachings of chaos theory for organizations: order is available, but not through the control of individual people or events. We need a new way of thinking, one that encourages us to look for order in patterns, not order in moment-to-moment occurrences. We will return to this theme later, but it is central to chaos science: **order is different from control**; order is available without our usual methods of interference.

Patterns or Fractals In Nature

Chaos science has contributed to new ways of seeing the patterns that shape nature and events. All around us, if we look at clouds, ferns, waterfalls, trees, rivers, or inside us at our circulatory system or lungs, we see complex patterns. Looking more closely, we observe that this complexity is formed from a few simple patterns that then repeat and repeat themselves at different sizes or levels of scale. This repetition of self-similar patterns creates “Fractals”—a new word in chaos science that defines a new kind of sensibility.

If nature creates complex structures by building them up from a few simple patterns, could we do the same in our organizations? Could we set in motion a few patterns what we mean by excellent customer service or what we expect as ethical behavior and then over time develop a complex organization from this simple base? Could we let go of managing individual behavior and instead focus on establishing the right patterns, and then let individuals express their interpretation of what the pattern means for them?

This kind of doing leads to increased emphasis on organizational values, vision and mission. Instead of treating these superficially, we need to realize that if we could create organization-wide belief and support for these, we would be establishing the basis for a well-ordered organization. In that organization, there would be much less need for traditional controls.

Chaos As A Route To Order

Chaos science also teaches us that chaos is a necessary stage for any organism seeking to become more adaptive and healthier in its environment. Scientists have observed that when a complex living system is subjected to high levels of change, it possesses an innate ability to self-organize—or reorganize-itself so that it functions better in its new environment. The process of self-organization is important to understand if we are to develop organizations that respond and grow constantly.

Self-organizing systems (which include us) will resist any change initially. But if they are confronted with new and different information, and if that information gets inside the system, it may grow and become so large that the system can no longer deal with it in its present structure. If this happens, the system falls apart, and at the stage of disintegration, it has two options. It can die, or it can reconfigure itself to be healthier in its environment. This time of disintegration is a passage through chaos, a time when everything is confusing and overwhelming, and nothing is certain. This “letting go” is a necessary precondition to moving to a higher level of creativity. Neither we nor our organizations can transform ourselves without being willing to pass through the dark night of chaos.

If chaos is a necessary step in the creative, life-growing process, then we need to change our usual approaches to it. We are so afraid of chaos, personally and in our leadership responsibilities, that we instantly shut it down if it starts to appear. Instead of allowing ourselves or our teams to be confused for a while, to muddle through, to let go of old ways of thinking, we want to rush to closure, to “just do something” so that the discomfort of not-knowing goes away. But the new science suggests that chaos is a necessary and important stage. If we want breakthrough thinking, we need to encourage people to be overwhelmed, confused, uncertain—not forever, but at key times when new thinking is required. We could work with chaos, rather than avoiding it. We could use it as part of our thinking process to create organizational or team responses that are truly innovative and successful.

Information As The Source of Organization

One of the more intriguing revelations in new science is a new understanding of the role of information. In organizations, we have for a long time understood that “information is power”, but what we have usually meant by this is: “If I have information, I have power.” As a resource in organizations, we have treated information very carefully, making sure only a few people know something, keeping it close to our chests, and severely limiting access to information during times of crisis.

But new science has a different appreciation of information. It appears to be the organizing process of the universe. Before anything shows up in material form, it exists as information. “The universe,” as one scientist put it, “is nothing but a set of signals.” Even our bodies, which we experience most certainly in their physical form, are information giving shape to flesh. This is most dramatically evident when we realize that the physical matter that makes up our different organs changes frequently: our skin changes every four weeks, we have a new liver every six weeks. But the information about us, or our liver, stays constant. New bits of matter form in our bodies around the information that exists about us, although no one can say **where** this information is located. So behind everything that is, is information. We don't manage information; it manages us.

This has important consequences for organizations. We could use information to organize work, rather than withholding it. The Japanese management theorist Ikujiro Nonaka states: “An organization that creates information is nothing but an organization that allows a maximum of

self-organizing order, or order out of chaos.” If we want to create high quality organizational responses, we need to think about the information that's available. With abundant, even superfluous amounts of information coursing through an organization, information that doesn't stay stuck in a role or function, people have the ability to organize their work as needed. They interpret the information based on their experience and vantage point, and come up with a response to the situation or crisis.

Of course, to let information loose in our organizations to the levels that the new science suggests, we will have to trust the people we work with. We will have to act on the belief that they are mature adults who have the best interests of the organization at heart. More and more organizations are discovering that their only route to health and resiliency is to open up their organizations to free-flowing information, around which trustworthy employees are free to organize work.

Relationships At The Heart of All Reality

In physics, scientists have been searching for the basic building blocks of matter for many years. Once they could peer into the subatomic level they were startled and disturbed by their findings. Instead of uncovering the most elemental pieces of matter, what they discovered were phenomena that could not be described by machine images of nature. They discovered instead dynamic movements of energy, energy that took different forms in a web of interconnections that could not be broken. Instead of single particles, they came to understand neutrons, protons, mesons, etc., as **waves of potential**, energy fields filling space. When these invisible waves encounter another wave, a particle appears that can be observed by physicists. But almost instantly, this particle meets with another energy field and becomes something else.

The conclusion of physicists is that particles can be thought of as “intermediate states in a network of interactions,” or as a “set of relationships that reach outward to other things.” At the heart of all, there are not blocks of anything; the universe is composed of relationships. Nothing comes into visible existence until it is in relationship with some other energy field.

In human terms, this learning makes a great deal of sense based on our experience of life. We don't know who we are, what we think or how we'll respond until we meet up with another person, event, or idea. We too are bundles of potential moving through space. When we meet up with another energy source, something is evoked from us—a behavior or reaction or thought. As we move onto other relationships, other aspects of ourselves become visible to us and others. We can't know who we are without our relationships. If we open ourselves to relationships with new people and new ideas, we will discover more and more insight into ourselves. Our best bet for discovering the complexity of who we are is to put ourselves into more and more relationships. This is true for organizations as well. New information and ideas are created when new relationships form. The more people participate in the organization, the more relationships there are and the more information there is to share and create. For example, so much critically important information is available to those organizations that talk to their customers—relationships that formerly had been avoided or excluded.

To take advantage of this relationship-rich world we inhabit, organizations need to free employees to have access to more and more people throughout the organization. Roles, functions, protocols all restrict access; they thereby also restrict the organization from realizing its full potential. To capitalize on who works for us and with us, our organizations need to open up and let people circulate more freely, making contact with others based on work needs, not status or history.

Vision As An Energy Field

We don't often think of all the invisible forces we rely on to lead a normal life, but how could we live without gravity or magnetism or electricity? Space is filled with these invisible fields. quantum physics posits that space is rich in the energy waves of particles. The only problem is these fields can't be observed directly; we only know them by their effects.

Do organizations have fields, invisible forces that can't be noted except by observing the behavior of employees, or by walking into that office or store? Most of us have dramatic experiences that indicate the existence of such fields. Perhaps it's walking into a tense meeting and immediately "picking up the vibes." Or perhaps it's the sense we get when we walk into a store of how we'll be treated as a customer.

If organizations do have fields, one of the more interesting questions is whether organizational vision acts as a field. Is the vision of the organization strong enough to be felt? If we meet with different employees at different levels of the organization, do we pick up the same messages or commitments to the vision? Is the space of this organization filled with consistent directions about purpose, direction, and values?

If vision is a field, then we need to think about how to create it. What types of activities and focus are required to fill the space of our organization with consistent messages? If we figure out how to do this, field theory suggests that people will be positively influenced by this field. Instead of having to deliver the same message to all employees, especially new employees, the field will communicate that to them. Although these ideas are conjecture, one thing that field theory suggests is that organizational change could be easier and faster than we had thought. If we don't have to directly influence each person or deliver training to every employee, change might occur through a consistent, intentional field that affects everyone in the organization simultaneously.

LAST THOUGHTS

New science requires us to question many of our most deeply held assumptions about how things work in life and in our organizations. None of these shifts is insignificant. All of them are worthy of further thought and conversation, as we try to invent and discover the organizations of the next century. Hopefully, these newer sciences point the way to a simpler way to lead organizations. But to arrive at that simplicity, we will have to change our behaviors and beliefs about information, relationships, control, and chaos. We will need to recognize that we live in a universe that is ordered in ways we never suspected, and by processes that are invisible except for their effects.

Perspective: An Exercise

For most of us, it is far more natural for us to focus upon the “parts” of a system or structure than it is to focus upon the whole. Locate a tree. Observe the tree.

- Write down a brief description of what you see when you observe the tree.

- Now, pull back and consider the tree as a living organism by asking: “What is the tree ‘doing’?”

- Pull back further and consider the tree in a larger context by asking: How would you described the tree as a system?”

- Finally, pull back outside the solar system and consider the tree as part of a larger ecosystem by asking: “ Is the tree a thing at all? Or is it simply part of a larger process?”

Do this same exercise but substitute yourself for the tree. Or, substitute your job, organization, or company for the tree. Do you get new insights from the answers?