



ROUTLEDGE MENTAL HEALTH CLASSIC EDITIONS

PRINCIPIA
AMORIS
THE NEW SCIENCE OF LOVE

JOHN MORDECHAI GOTTMAN



Principia Amoris

Written by world-renowned relationship expert Dr. John Gottman, this book unveils the hidden science behind love and relationships and provides readers with tools for predicting relationship durability.

This classic edition includes a new foreword with reflections from Dr. Paul Peluso. Drawing from groundbreaking research conducted at Gottman's Love Lab, Gottman reveals that the success or failure of a relationship can be predicted with remarkable accuracy. Through a combination of psychological insights and innovative mathematical models, Gottman introduces readers to the Love Equations—powerful tools that can diagnose relationship issues, foster understanding between partners, and even prevent breakups before they happen. This book features Gottman's signature “Four Horsemen of the Apocalypse” metaphor which describes the common communication styles that can predict the end of a relationship. Readers also learn about the five couple types, five recipes for good relationships, and 45 natural principles of love.

An invaluable resource for mental health professionals and curious readers alike, *Principia Amoris* provides enlightening perspectives on love through a blend of science and heart. Whether for couples looking to strengthen their own relationships or for clinicians seeking insight into the complex dynamics of human connection, this timeless work offers tools and wisdom that endure.

John Mordechai Gottman, PhD, is an award-winning psychologist and researcher known for his work on marital stability and divorce prediction. He has conducted 50 years of research with thousands of couples, and is the cofounder, with his wife, Dr. Julie Schwartz Gottman, of the Gottman Institute. He is also the executive director of the affiliated Relationship Research Institute and a professor emeritus of psychology at the University of Washington, where he founded “The Love Lab.” More information about John and the Gottman Institute is available at www.gottman.com.

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Principia Amoris: The New Science of Love

By John Mordechai Gottman

Principia Amoris

The New Science of Love

Classic Edition

John Mordechai Gottman

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Foreword to the Classic Edition of *Principia Amoris*

Paul R. Peluso

When I first met John Gottman in 2008, I barely knew what a dynamical systems mathematical model was! I was a couples and family therapist, and a young Assistant Professor teaching mental health counseling students. I was conducting interviews with some of the “masters” of couples and family therapy for a book that I was doing, and by a stroke of luck (actually, I followed him up an escalator after he finished a book signing at the American Counseling Association annual conference that year to ask him), I found myself sitting across from John Gottman in his therapy room in Seattle, Washington. The subject of the interview had to do with the changes in people’s perceptions of aging, and how it was impacting family therapy at the time (i.e., “sixty is the new forty”). Being very excited at the prospect of spending time with someone that I admired as much as I did John, in preparation for the interview, I re-read much of his published work. Like many couples therapists who had been trained in the 1990s, his *The Seven Principles for Making Marriage Work* and *The Marriage Clinic* were “must reads.” However, I wanted to be even better prepared than that. So, I read anything I could get my hands on, including his 2002 book *The Mathematics of Marriage*, which was the text where he had the space to go beyond what was able to describe in his journal articles about the dynamical systems mathematics that he (along with James Murray, and some of his other colleagues) used as the underpinning for his astonishing predictions. Reading this book (the contents of which, I will discuss a little later) had two profound effects on my life, and my relationship with John.

First, in my recollection of that interview with John in his office, the interview itself was not that interesting. I felt like John was being “nice” to this kid who had flown out to meet and interview him, but the conversation was either constrained by the generic questions that I was asking, or that the subject wasn’t that interesting. At some point, he made a passing reference to *The Mathematics of Marriage* dismissingly, saying: “No one has really read that!” And I said: “Oh! I actually did read it! And if we have some time, I would like to ask you some questions related to it!” At which point—again in my own mind—John seemed to perk up and become genuinely interested. The conversation took an entirely different trajectory as we discussed his early career studying to be a mathematician (which he later abandoned to study psychology...though not completely as it turned out!). The second transformational thing about the interview was that when we did have time to discuss the book, I told him that I wanted to apply his method to the therapist–client relationship and asked him if he would be willing to work with me on it. To my immense gratitude, he said yes, and I have been the beneficiary of a continuing relationship with him working on this project (and several others) to this day.

In that same interview back in 2008, John recounted the story of his meeting with family therapy pioneer Ivan Boszormenyi-Nagy at a dinner where, upon recognizing John he said “You’re the guy who does the work with couples? You should read Rappoport!”

While Boszormenyi-Nagy didn't really elaborate, John did follow up and read the work of Anatol Rappoport, who was a mathematician and game theorist. He deeply admired his work in applying his ideas to conflicts between groups and creating peace and told me that it was reading the book *Fights, Games and Debates* was where he got the inspiration for what became the "Gottman-Rappoport technique" for couples. This is a central technique of Gottman Method Couples Therapy of not trying to persuade your partner until you can state—to their satisfaction—their position. Of course, being equally inspired, I found a copy of the book and (tried to) read it as well. It took me 2 years to finish it because it was so densely written. I felt like I was a complete fraud as an academic because I could hardly get through the writing and the concepts! I later sheepishly confessed this difficulty to John, and he said that I took *him* a long time to read as well because it was so complex. Suddenly, I didn't feel so bad! I mean if John Gottman found it difficult, then I wasn't dumb! Unlike Rappoport's book, however, John in his writing has striven to make the complex understandable without watering it down and stripping away the science. To me, John doesn't take his audience for granted. He believes that they are smart enough to understand the complexity, as long as *he* is skilled enough as a writer to make the material (the science behind his research findings on couples) clear enough to be understood. That is the real gift of the *Principia Amoris*. He neither dials back on including either the math or the science, nor does he forget the rich clinical information that the couple's conflicts bring, and how understanding and intervening in this is the real reason for his work. It is not an esoteric exercise designed to generate scientific articles that (although are important) never get translated into clinical interventions and implemented by practitioners.

John's approach is to take in whatever he can and utilize it for explanation or inspiration. Take for example the idea of a "trust metric" that John describes in this book. This was a concept that he got from the TV show *Numb3rs*. The premise of the show was an FBI agent and his brother (who was a genius mathematician) would try to solve difficult cases with mathematics and other scientific processes (so you could see why John liked it!). In one episode, the protagonists used a concept called a "trust metric" which was a mathematical method for weighing how trustworthy a person's statements were. John was very excited to learn about this and wondered if he might be able to adapt it for his work. As he began to dig into it, he learned that it was just a plot device and that it didn't really exist! However, that didn't stop John from imagining what if one could actually be constructed? He began to devise a way to make something that would be feasible for use with couples using game theory. Not only did he do that, but then he empirically validated it and showed how targeted interventions could be used to increase trust (and that trust can remain in place up to a year later!). This is a great example of how John (like all great scientists) work: Get inspired, ask "What if" and then get to work with rigorous observational methods, and make groundbreaking discoveries.

Before I discuss the book and its contents, there is something in the original Preface to the book that I want to comment on, and maybe disagree with John about (slightly). In his Preface, John discusses his vision for the book and its inspiration being drawn from Sir Isaac Newton's *Principia Naturalis*. First published in 1687, the *Principia* (as it is commonly called) laid out Newton's three laws of motion ("An object in motion will stay in motion...") and also created a mathematics to explain these laws along with gravity. Its scope was breathtaking as it sought to explain the motion of planets as well as describe "vanishingly small" shapes. It revolutionized physics and set the groundwork for scientific discovery in the areas of astronomy, engineering, technology, and the philosophy of science. According to John:

The book inspired the imagination of scientists everywhere throughout Europe and launched new philosophies in the Age of Reason. It was without a doubt, one of the greatest books of all time...The laws of all motion were revealed in

a few simple equations and three principles...Newton was afraid to say much about the new math he had invented—the differential calculus—so he presented all of his proofs geometrically, in a language familiar to his contemporaries... Newton's translation from calculus to geometry was as great a task as discovering the three principles of motion in the first place. Making math palatable was a challenge even in the 17th century. It still is." (p. vi)

So, where do I disagree with John in titling his book after Newton's? It is because I do not think that *Principia Amoris* is his *Principia Naturalis*. I believe that his earlier book *The Mathematics of Marriage* (that I referenced earlier) was his version of the *Principia Naturalis*. It set out his basic equations for understanding love relationships, which set up a new way to think about couples and their conflicts. It also laid out where there were flaws in the conventional thinking about couples, and provided a new way to think about potential interventions for ones who were in distress. At the time of its publication, computer technology and programming was starting to make this much easier, but it still required some work to fully understand it. It was a call to the profession to take the technology that was dynamical systems mathematics and apply it to a human system (the couple). This was no accident, by the way, as John was trying to show how General Systems Theory, which was the underpinning of Couples (and Family) Therapy could be taken from the realm of the theoretical into the realm of the practical (and empirical). Concepts like equilibrium, homeostasis, attraction, influence, and inertia, which were originally borrowed from biology by the early Systems Theorists, could be more than just metaphors. They could be measured, modeled, and monitored to show progress, change, or distress. In this way, I think that *The Mathematics of Marriage* is John Gottman's *Principia Naturalis*.

So, what about THIS book? Should he change the name? No, not at all! That's because there is another *Principia* that I think is a better description of this book. Between 1911 and 1913, Alfred North Whitehead and Bertrand Russel published a three-volume work called *Principia Mathematica*. In these texts, they redefined mathematics as a branch of logic and create unified methods to understand it. They had three primary objectives: 1. To express the entirety of mathematics from a few simple axioms; 2. Use symbolic logic to express these axioms simply; and 3. To use these to solve the mathematical paradoxes that had confused mathematicians (and other scientists). Like Newton's *Principia* the *Principia Mathematica* also helped to clarify and define the philosophy of science. It inspired mathematicians and scientists of the 20th century who would later go on to invent computers and many of the technologies of the digital age. The reason why, in my opinion, I feel that John's *Principia Amoris* is his version of *Principia Mathematica* is because one of the branches of science that was directly inspired by Russel and Whitehead's work was the science of General Systems Theory as well as Communications Theory, both of which formed the basis of couples and family therapy of Bateson, Haley, Watzlawick and others. Specifically, the *Principia Mathematica* defined the "theory of types" that helped systems theorists to define and understand the foundational constructs of complex (and often problematic) communication patterns like double-binds. It also clarified mathematical paradoxes that would also inspire early Family Systems Theorists to utilize paradoxical interventions when trying to help individuals, couples, and families to disentangle themselves from their problematic behavior. John, in the *Principia Amoris*, even talks about how von Bertalanffy's pivotal book *General Systems Theory* presented several mathematical questions about relationships from which his love equations were an answer. As a result, I would argue that John's *The Mathematics of Marriage* is more reflective of Newton's *Principia*, and the *Principia Mathematica* is the intellectual stepping-off point for the *Principia Amoris*.

When reading any of John's books, you come to realize that he has a true passion not just for the subject, but in communicating it to the reader. He doesn't rely on cheap tricks like overusing jargon to skip over ideas that are too difficult. Instead, he takes the time to

really refine his writing to be the clearest that it can be with a topic as complicated and fraught as explaining couples dynamics mathematically. He also understands the power and impact of stories to bring to life his principles, and he uses metaphors to illustrate these clearly. For example, in *Principia Amoris*, you will find references to the Mad Hatter and Goldilocks (among others), along with stories from both his personal and professional life. After re-reading *Principia Amoris* I remember why it is such a good book! It is the book that thoroughly explains the “magic” (i.e., science) behind his bold claims of being able to detect with surprising accuracy which couples relationships are successful and which are not. It was a claim that mesmerized me as a beginning clinician when I first became aware of his work almost 30 years ago. This book has all the hallmarks of a “Classic.” It has the very human story-telling of couples struggling and finding success as well as the scientific research base to back it up. With the dialogues from real couples, he takes you (literally) into “the room where it happens” and uncovers the couple’s problematic discussions, as well as describes the math behind it. This combination is often woefully lacking in other professional clinical texts, or is so poorly cobbled together from cherry-picked findings that it is disingenuous. Distinctively, John’s work is the OPPOSITE of that, and we are all the richer because of this.

One of the main reasons for this has to be due to John’s greatest collaborations, that with his wife Julie Schwartz Gottman and the development of Gottman Method Couples Therapy. Throughout the *Principia Amoris* John describes how Julie helped him take the science and math that was central to his research and make it applicable and clinical. Towards the end of the book, and in the Appendices, he details some of the core principles of Gottman Method Couples Therapy, and he provides PRACTICAL advice to couples. This translational research is actually the highest aspirational goal of research, and one that is both crucial for science and (at the same time) the hardest to achieve. As many of the social and medical sciences clamor for scientific breakthroughs to be put into everyday practice (and struggle with the fact that commonly they are NOT), John and Julie Gottman have done just that. It is a blueprint for all clinical researchers and practitioners to follow.

As I said in the beginning, I have had the privilege to know John since 2008. Being personally in his company has allowed me to hear many of his stories. However, there was one that I did not know about until I re-read the *Principia Amoris* (yes, I even missed it the first time!). It is in the beginning of Chapter 7, when he recounts the story of meeting Martin Raush in 1974, when John was an Assistant Professor at Indiana University just as Raush was publishing his landmark book *Communication, Conflict and Marriage*. I will let John pick up the story:

(H)e had only one advance copy of his book. I picked him up at the airport and took him to dinner and heard all about the first study ever done observing couples through their first pregnancy as they became new parents. I implored him to lend me his only copy of his book and I stayed up all night reading it, again and again, taking manic notes filled with questions. Next morning I was able to ask him questions almost all day about his landmark study. He subsequently agreed to send me all of his tapes (all audio) and we could recode them in our lab with our newly developed video observation system and compare the results to the results of our first study. It turned out that our two studies match almost perfectly in discriminating happy from unhappy married couples. He taught me how to analyze the data in the new way that made it possible to search for sequences of interaction between partners. That was another breakthrough in Raush’s work. His research and guidance were seminal for me and my students (p. 114).

I realized that this story could have just as easily been the story of John and I back in 2008! He was the seasoned researcher, and I was the new assistant professor eagerly reading up on his work. I guess that John saw something of himself in me and decided to take a chance on working together. This is the personal legacy of John’s work, and my relationship

to him. Today, I covet any time that my administrative and faculty duties spare me so that I can obsess over the shape of influence functions (are they linear or curvilinear?), and tweak phase portraits that are created by initial state and inertia parameters (don't worry, you will learn about them in this book!) at odd hours of the day or night—all the while you are fretting that they don't capture enough of the relationship you are studying. The reality is, that is what knowing John Gottman will do to you. He will inspire you to think beyond what you had considered before, adopt a rigorous stance of questioning your assumptions, and challenging your own work in order to make sure that you get it right. And if you can't explain it clearly, you don't know it well enough. He will also encourage you, and give you the confidence to follow your curiosity and go a little farther. So, reader, if you are willing to take that ride, buckle up and turn the page! You are in for a groundbreaking “classic” work in the area of couples and their romantic relationships that is truly worthy of being called a *Principia*.

Paul R. Peluso
Norejane Hendrickson Distinguished Professor
Florida State University
Tallahassee, Florida
April, 2025

Preface

Science was revolutionized in the second half of the 17th century when Isaac Newton published the first edition of his book *Mathematical Principles of Natural Philosophy*. It fondly became known as “*The Principia*.” The book inspired the imagination of scientists everywhere throughout Europe and launched new philosophies in the Age of Reason. It was, without a doubt, one of the greatest books of all time.

The new mathematics Newton (and Leibniz) developed helped to describe gravity, unifying the motions of a projectile on our planet, which Galileo Galilei had identified, with the motions of the moon and the revolutions of the planets around our sun. What a grand unification! The laws of all of motion were revealed in a few simple equations and just three principles.

Newton was afraid to say much about the new math he had invented—the differential calculus—so he presented all his proofs geometrically, in a language familiar to his contemporaries. It wasn’t until Leibniz introduced calculus to the world that Newton announced that he had discovered the calculus much earlier. My physics professor, the late Philip Baumel, said that Newton’s translation from calculus to geometry was as great a task as discovering the three principles of motion in the first place. Making math palatable was a challenge even in the 17th century. It still is.

The great astronomer Johannes Kepler’s lifetime achievement in 1619 was discovering the three laws of the elliptical motions of the planets. That monumental discovery was based on the painstaking and careful observations of the motions of the known planets (without a telescope) by Tycho Brahe. Kepler’s discovery of the elliptical orbits of planets was a huge advance in our understanding of nature. It was the crowning achievement of his entire lifetime.

Yet Kepler’s own relationships with people, including his relationship with his mother and his own marriage, were extremely tortured. He could comprehend the motions of the planets, but the emotions of humans eluded his great mind.

Among Newton’s *Principia*’s truly amazing and awe inspiring results were that Kepler’s laws were *deduced* by Newton from the general principles of the inverse square law of gravitation and conic sections. How that must have moved scientists in his day! Newton, in his astonishing lifetime, not only revealed the laws of motion, but, probably more importantly, taught us, together with Galileo Galilei, how to think about scientific experiments.

Yet despite his incredible genius, Newton’s own love relationships with other people were, like those of Kepler, either nonexistent, or highly arduous.

Three centuries later, Albert Einstein fundamentally changed much of what Newton had discovered, and created an even more beautiful understanding that unified space, time, mass, energy, and gravity. He summarized his findings in an elegant equation in 1916 using the math of differential geometry and tensor analysis in his theory of general relativity. It was a stunning achievement.

After World War I, in 1919, a British expedition launched to see if stars could bend light confirmed the general theory of relativity. After that senseless Great War, it was remarkable that a *British* expedition set out to test a *German* scientist's theory. The expedition inspired a new sense of the unifying international nature of scientific exploration.

The amazing results of that journey rocketed Einstein into a new position of international science celebrity, which was a real first. The public was used to Hollywood movie stars becoming world-wide celebrities, but not scientists. The public loved Einstein. As he grew older, his words became almost synonymous with wisdom itself. In some Internet searches, Einstein is considered the most quoted person in history. Yet Einstein's own love relationships were also tortured, and, by his own admission, mostly unsuccessful.

Just as Newton and Einstein revealed the natural principles of **motion**, the research of many scientists has now converged to reveal the natural principles of **emotion** in love. The enormously important area of love relationships, which so eluded these great thinkers, has now also yielded its natural principles to the methods of science.

Here is what this book is about: Just as the entry of new mathematics by Newton and Einstein explained and illuminated so much about physical nature, new science and new mathematics can now illuminate *human* nature, in particular the nature of love relationships. There is now a remarkable coming together in the work of a small group of researchers who have studied relationships and treated ailing love relationships. Coupled with modern mathematics, this *Principia* will explain how that coming together offers *both the prediction and the understanding* of love relationships.

The news is that we actually can predict the future of love relationships, and that this prediction is powerful and has high accuracy. The prediction has been replicated many times. Laboratories other than mine, and Robert Levenson's, have also been able to predict the future of love relationships. Here is the news of this book:

We scientists can now predict the future of love relationships, and we now also understand that prediction.

This book explains both the prediction and the understanding.

Our news is even better than that. Not only can we predict and understand love, but now at close to a 75% success rate:

We can also now help couples:

- 1 Prevent love relationship disasters;
- 2 Recognize the signs of a promising relationship; and
- 3 Recognize the signs of a doomed relationship.

I think that's pretty good news.

What about our ability to heal a seriously ailing relationship? In my opinion, at this point we have to be both cautious and humble in our conclusions in this arena. In our

current work—and in Susan Johnson’s Emotionally Focused Couples Therapy (EFT)—we can help a reasonably high percentage of couples (in the 70 to 75% range) heal an ailing relationship. In our lab we can help about 70% of couples, if they are not too seriously distressed, with the Gottman Institute’s 2-day *Art and Science of Love* (ASL) seminar; if they are seriously distressed, an additional nine sessions of couples therapy is required to avoid relapse one year after treatment.

In Chapter 13, I will present the new evidence that we can **change the love equations** for *very distressed couples* with our 2-day ASL seminar plus nine sessions of couples therapy that follows the methods my wife and I have developed, which are available on our website www.gottman.com.

However, if, in addition to very serious couples’ distress there are additional problems and co-morbidities—like addictions, domestic violence, suicidality, extra-marital affairs, psychopathology, poverty, low levels of education, job loss, depression, multiple partner fertility, previous incarcerations, multiple military combat theater deployments, post-traumatic stress disorder (PTSD), psychosis, or personality disorders—our success rates are either entirely unknown, or considerably lower, and our relapse rates are higher within 2-years-after-treatment. I believe that characterizes our field at the moment.

Why can’t we do better? Well, for one thing, we know from Cliff Notarius’ work that most couples wait about 6 years to get treatment after they recognize that their relationship is in serious trouble. By then, many problems have developed. As UCLA psychologist Thomas Bradbury once wrote, couples therapy is not just like an emergency room doctor setting a broken leg. Rather, it is as if that doctor also had to deal with the fact that this patient had walked around on the broken leg for 6 years, and thus sustained many more compounded injuries and infections. I am really encouraged by the fact that Sue Johnson’s Emotionally Focused Couples Therapy is beginning to demonstrate an oft-replicated ability to deal with some of these co-morbid disorders as well as marital distress. However, in my own view, the field still has a long way to go.

Unfortunately for our field, federal priorities in the USA or Canada currently no longer favor funding for relationship research. So, we relationship scientists have had to turn to private foundations, or to our own sales of clinical services, or to our own money to fund our work. Hence, at this juncture our progress has been seriously slowed. Yet, despite our field being a low priority at the moment, still some important work is getting done.

The news is that there is now a remarkable convergence in our scientific understanding of love, and how to help couples. This book is about that understanding.

WHY CARE SO MUCH ABOUT UNDERSTANDING LOVE?

In 2005, 14 scholars got together to review what the benefits of marriage might be, as determined by social science research. Their report was cautious, and quite lengthy. In the beginning of their report they wrote the following:

Married men drink less, fight less, and are less likely to engage in criminal activity than their single peers. Married husbands and fathers are significantly more involved and affectionate with their wife and children than men in cohabiting relationships (with and without children). The norms, status

rewards, and social support offered to men by marriage all combine to help men walk down the path to adult responsibility. Fourth, beyond its well-known contributions to adult health, marriage influences the biological functioning of adults and children in ways that can have important social consequences . . . Finally, this report explores the association between relationship quality and the institution of marriage, given that relationship quality is an important predictor of child and adult well-being (especially for women). We find that the relationship quality of intimate partners is related both to their marital status and, for married adults, to the degree to which these partners are normatively committed to marriage. So, claims that love, not marriage, are crucial to a happy family life do not hold up. Marriage matters even or especially when it comes to fostering high-quality intimate relationships. In summarizing marriage-related findings, we acknowledge that social science better equipped to document whether certain social facts *are* true than to say *why* they are true.

That report was a resounding endorsement of marriage, and these conclusions are only part of the story. In this book I hope to talk about *why* these facts are true. My focus is on understanding how love works or malfunctions. We can now discuss *why* these things are true, and the math will get us there.

The report I quoted is only a small part of a much larger scientific literature linking the quality of people's closest relationships to health, longevity, and well-being. Thirty years ago, these findings initially surprised social epidemiologists, but it has held up over time. Ignoring what is cause and what is effect, there is no doubt that people in happy, stable, committed relationships live significantly longer, are healthier physically and psychologically, are wealthier, and have children who do better in most aspects of living than people who are alone, or in uncommitted relationships, or in unhappy-stable relationships.

My research, and the work of others, supports these benefits for the success of any committed love relationship, whether heterosexual or homosexual, and whether couples are married or not. Love relationships are simultaneously the greatest source of comfort and happiness in our lives, but also potentially the greatest source of intense stress and misery. A broken relationship is one of the major sources of life stress in the famous Holmes and Rahe scale of life stresses.

Current estimates are that about half of all married relationships—over a long 40-year period after the wedding—do not last. Their endings are often not amicable; all too often love turns into hate. Aside from relationship breakups being one of *the* most stressful life experiences of all, hostile breakups have deleterious effects on children. Through the work of developmental psychologists like Eleanor Maccoby and E. Mavis Hetherington, we have learned a lot about how to minimize these deleterious effects on children. My own work on emotion coaching has also helped divorcing parents buffer their children from the negative effects of an ailing parental marriage and divorce.

Even after a heart-breaking failed marriage, most of us keep looking for new loves, which many have called the triumph of hope over experience. Most men and women remarry within about 5 years after a divorce; men remarry sooner than that. Remarriage has become so common in the USA that the Census Bureau says that today the *majority* of all weddings in a given year are now second marriages for at least one of the new spouses. The thirst for true love is unquenchable.

A great deal of very good research has shown that a happy relationship is related to both men and women living longer (perhaps even an average of about 8 years longer;

see also works by Berkman and Syme; and Burman and Margolin), being more healthy, recovering from illnesses faster, becoming wealthier (even controlling for education and experience), having better relationships with children, and having children who are more resilient and more successful academically and socially. That's compared to being in an unhappy relationship, or being alone.

So, there is a lot to be gained by knowing how to have a happy, lasting love relationship, in marriage. It is no wonder that the dilemma of what makes relationships succeed or fail is the subject of so many plays, songs, novels, and treatises, and the stream continues to be endless. New novels, plays, and memoirs emerge every week. There is even a floodgate of folk wisdom and a wild mix of information and misinformation presented every day on afternoon television and radio by self-appointed show-men and show-women who pretend to be gurus who understand love. It is all evidence of the public's hunger for the truth about love.

Relationships occupy the thoughts of many of us much of the time. For example, during major natural disasters like the Great Tsunami of 2004, which released the energy of 23,000 Hiroshima atomic bombs and killed over 150,000 people, leaving millions homeless in 11 countries, social workers and therapists poured in to help the survivors cope with the disaster and the trauma. They later reported that the major thing the survivors wanted to talk about in counseling sessions and crisis intervention sessions was their love relationships, not the disaster.

Research has revealed that relationship issues are the major topics people bring to their psychotherapists all around the world. In itself that is an astounding finding.

This book is a summary of what I have learned as a scientist and a couples therapist in over four decades of empirical research and clinical work on relationships. We have had major successes, with high levels of prediction of the future of heterosexual and same-sex relationships. We have now been successful in understanding our predictions using the mathematical modeling of relationships with what I'm calling "**The Love Equations.**" We have also been successful at *preventing* relationship distress during major life transitions (such as the transition to becoming parents) and, to a lesser degree, at *healing* ailing relationships.

Can science bring clarity where artists have tried so hard and failed? Is there a wisdom to be learned at all? Do empirical findings hold? Do they replicate? Can we understand our results? Can we discover truths that hold everywhere on our planet? I believe that now the answer to these questions is an unqualified yes. This book is about our understanding of what makes relationships lasting and happy. I hope the knowledge that the new mathematics and science bring can help people understand love and prevent and alleviate the pain and tragedy of broken love relationships.

IS MATHEMATICS COLD AND UNFEELING?

Does the fact that I will present equations *about* emotional communication mean that this work is cold and devoid of empathy? In this book I will show you the development of a math that is all *about* emotions among committed lovers. The math will represent the *display* of emotions, the *subjective experience* of emotions, and the *physiology* that accompanies emotions using **numbers over time that tap the emotions of lovers.**

The math and the numbers describe the love relationships of lovers who are being emotional with one another, discussing their deepest feelings, their humor, joy, interest, excitement, and also their anger, hurt, sadness, fear, and anguish. As experienced, this stream of emotions is often akin to being in a boat in a rough sea. All around us the big waves sweep away and churn the small ship we hang on to. The rise and fall of the sea seems at times exhilarating and exciting, but also at times dangerous and chaotic.

Yet within this apparent roiling chaos there are predictable patterns in those numbers about emotions, patterns whose clarity is often far beyond the ability of our intuitions. The mathematics builds on these predictable patterns. It creates theory that can enlighten our weak, and usually faulty, intuitions. The math can guide us as we therapists experience empathy for our clients' pain. The math can guide us toward the objectives our therapy needs to have. If we don't know where we are headed with our clients, and if we don't know how to get there, all the empathy in the world will not help.

The math is not cold, nor is it warm. The math is not hard and mean, nor is it warm and empathetic. It is merely true. It guides us toward the truth about the patterns the numbers reveal. We supply the love, we supply the empathy, and we have concern for our clients. We resonate to their pain. We provide the hope.

Yet there is no greater source of hope than our confident knowledge of what our goals are and what to do. The math guides us by providing knowledge and understanding. It is my hope that therapists will embrace the understanding that the math can provide. The logic and clarity of the mathematics provide a guide toward a unique truth about couple love relationships.

Our humanity can embrace the truth and present that knowledge to our clients with love and empathy. The math doesn't replace that love, caring, and empathy of a kind, compassionate therapist. It merely guides empathy toward healing and health. These new mathematical concepts need to diffuse through our language and *become commonplace tools for talking about love.*

With the invention of Velcro, even a toddler could competently fasten her shoes. She does not need to know who invented Velcro. She does not need to know how Velcro works. Perhaps the same thing can happen with these new mathematical concepts. Even children ought to be able to learn what we professionals now know about love relationships. These are my hopes for this new *Principia*, which elucidates the new mathematics and science of love. Perhaps this *Principia* will only be read by nerds like myself, and the advice in this book may help take only us nerds to Nirvana, or Nerdvana. However, my hope is that clinicians, and even others in the general public, may find useful advice in these "natural principles of love."

The great physicist Richard Feynman once wrote about the idea that scientific understanding of a thing of beauty does not detract from, but instead adds to, the wonder and awe we naturally feel for the beautiful things in life. He wrote:

I have a friend who's an artist and he's sometimes taken a view which I don't agree with very well. He'll hold up a flower and say, "Look how beautiful it is," and I'll agree, I think. And he says—"you see, I as an artist can see how beautiful this is, but you as a scientist, oh, take this all apart and it becomes a dull thing." And I think he's kind of nutty. First of all, the beauty that he sees is available to other people and to me too, I believe, although I may not be quite as refined aesthetically as he is . . . I can appreciate the beauty of a flower. At the same

time I see much more about the flower than he sees. I could imagine the cells in there, the complicated actions inside which also have a beauty. I mean it's not just beauty at this dimension of one centimeter, there is also beauty at a smaller dimension, the inner structure. Also the processes, the fact that the colors in the flower evolved in order to attract insects to pollinate it is interesting—it means that insects can see the color. It adds a question: Does this aesthetic sense also exist in the lower forms? Why is it aesthetic? All kinds of interesting questions, which shows that a science knowledge only adds to the excitement and mystery and the awe of a flower. It only adds: I don't understand how it subtracts.

Susan Johnson, in her book, *Love Sense*, expressed coherently my motivation for writing this *Principia*. She wrote:

We know that love makes us vulnerable, but also that we are never as safe and strong as when we are sure we are loved . . . Perhaps because love seems so baffling and unruly, we appear to be losing all faith in the viability of stable, romantic partnerships. On any given day, we scan press accounts of famous folks caught in adulterous affairs and catch videos on TV, read online advice blogs extolling swinging as the way to combat inevitable relationship fatigue, and scan op-ed pieces maintaining that monogamy is an antiquated and impossible concept that should be junked . . . [yet] today, adult partnerships are often the only real human ties we can count on in our mobile and insanely multitasking world (pp. 1–2).

As Johnson then noted, the current scientific understanding of love can now illuminate the darkness and pain that has surrounded love for eons. It is my hope that the science and mathematics in this *Principia* will illuminate that darkness that surrounds love just a little bit. I will present the mathematics, but put the equations to the side so that they can be skipped by those readers who find them as incomprehensible as Klingon, while still being available to those readers who find them as fascinating as Klingon.

Acknowledgements

For the past 18 years, my jewel, my brilliant and beautiful wife, Julie Anne Schwartz Gottman, friend, colleague, and companion and I have been working together, researching together, arguing together, learning to love one another, healing the wounds we create along the way, and creating methods for helping couples and for training clinicians in scientifically-based couples approaches that also honor practice-based evidence. Without her, applying the basic research that I have done separately and together would have resulted in methods that were empty, devoid of deep understanding, empathy, sensitivity to people's pain, and significant wisdom. I actually finally got to *have* a great relationship, instead of just studying them. Thankfully, after a while it became hard to recall who invented what in our collective work trying to help couples and train clinicians. Her strength, intuition, imagination, and keen intellect have been so vastly enriching. I cherish you, Julie Anne.

Almost all of my work for the past four decades has been made possible by a magical life-long collaboration with my best friend, Robert W. Levenson, who was also best man at our wedding. Nothing can compare with this great blessing of friendship, love, and camaraderie that has endured and enriched our lives for so many years. Based on learning and laughter, Bob and I have enjoyed the great gift of deep and lasting friendship. At every talk I acknowledge Bob's contribution.

I would like to acknowledge the important interactions I have had over the years with my dearest colleagues Steve Asher, Carolyn and Philip Cowan, Paul Ekman, Jean Goldsmith, Mavis Hetherington, Susan Johnson, James Murray, Bill Pinsof, Ross Parke, Steve Porges, Ed Tronick, Dan Wile, and Jeff Zeig.

The James Murray group was, of course, the basis of being able to develop the mathematics that this book is based upon. The experience of working together was such an enormous gift. I could never have done it without them. In particular, I want to acknowledge the work of Ellen Hamaker, Cathryn Swanson, Kristin Swanson, and Tara Madhyastha in developing the mathematics and the computer work necessary to go from theory to real application. Kristin Swanson's work on repair and damping helped illuminate the benefits and also the limits of these ideas. Ellen Hamaker taught us how to estimate all model parameters at once, and to realize that inertia was higher in negative than in positive affect. Julian Cook got us started computing many times when we were stuck without theory. Then the ideas flowed. His creativity was a point of brilliant light in the darkness. In this regard I also want to acknowledge the work of K. K. Tung in moving the math from difference equations to differential equations. For him, this was just an exercise in

teaching undergraduates, but for me it was a big step forward. He especially showed us the vulnerability of validating couples once startup becomes negative, and the hidden strength of conflict avoiders. These were amazing insights that psychologists and sociologists still haven't seen, and that includes me. Again, the math, in the right hands, illuminates.

I would also like to acknowledge the work of my many talented students, laboratory staff, and colleagues over the years. They have all made this work possible. They are: Julia Babcock, Renay Bradley, Kim Buehlman, Sybil Carrere, Jim Coan, Julian Cook, Jani Driver, Sharon Fentiman, Dan Friend, Bill Griffin, Carole Hooven, Vanessa Kahen-Johnson, Neil Jacobson, Lynn Katz, Itziar Luzarraga, Howard Markman, Kim McCoy, James Murray, Eun Young Nahm, Cliff Notarius, Jennifer Parkhurst, Regina Rushe, Joanne Wu Shortt, Amber Tabares, and Dan Yoshimoto. It's been a long and pleasant journey, and I am grateful for all their hard work and creative energy. I lack Bob Levenson's brilliance as a mentor, but it has been great collaborating with all my students.

What professor has a company behind the work done in a lonesome lab? I am so blessed. The Gottman Institute that Julie and I founded with Etana Kunovsky about 18 years ago has been a vital fountain of sustained support. Etana's optimism and creativity kept us from going under many times. Thank you, Etana. Whenever I speak at a talk or workshop, I think about how lucky I am. I know of no colleague who has such an entire energetic company and an enthusiastic, hard-working staff to support him. Now that Alan Kunovsky, Etana's husband, has taken the reins of the Institute, we have really flourished. Our office is now filled with young people Alan has been mentoring at the business school of the University of Washington and through Alan's energetic participation with Seattle's Rotary. He brought to this task decades of being a great businessman in South Africa, wisdom, a sense of calm, enthusiasm, drive, and great compassion and creativity. He also brought to us his love for motorcycles, which I share. He and his wife Etana have become our great traveling companions as we meet therapists and researchers all over the world who are interested in the same questions we keep asking.

Furthermore, it looks like we are actually going to be starting to fund our research from the money we make at the Institute. Again, that step is due to Alan's vision. Julie and I love traveling the world with Alan and Etana. It is pure fun. After all of this outreach to clinicians and directly to couples, we are able to open the Love Lab again.

I would like to mention our hard-working staff: Zoya Bahn, Sonny Chacko, Kristi Content, Michael Fulwiler, Belinda Gray, Dori Greenaway, Allie Guerrero, Kendra Han, Laura Heck, Adam Kryzer, Ellie Lisitsa, Kyle Morrison, Dr. David Penner, Katie Reynolds, Kathryn Schwartz, Aziza Seykota, Lindsay Simon, Jacqueline Sundquist, Keeley Trygstad, Cynthia Shultz Williams, and Linda Wright.

Our therapists have been also been a source of understanding and inspiration, as well as challenges. I would like to acknowledge our Gottman-Certified Therapists and colleagues Laurie Agee, William Bumberry, Lisa Baker-Wilson, Christina Choi, Peck Cho, Connie Foits, Ken Fremont-Smith, Marcia Gomez, Andy Greendorfer, Barbara Johnstone, Peg Moss, Michael McNulty, Bob Navarra, Dave Penner, Michael Rediger, Trudy Sackey, Ruth Saks, Maureen Sawyer, John Slattery, Olea Smith-Kaland, Terry Sterrenberg, Lawrence Stoyanowski, Mirabai Wahbe, Darren Wilk, Pat Worthey, Lynda Vorhees, and Ray Varlinsky. They have greatly enriched our lives, and shared the dream of a world of marriage clinics all interconnected and working to help make relationships more effective at loving. The great thing is that they have taken our work farther than we could ever have done, innovating and creating lovely new ideas and applying our ideas to problems we

would never have thought of. That includes marathon couples therapy and the refresher workshop for couples, the former due to Andy, and the latter to Andy and Mirabai. Bob Navarra is taking our work into the issues surrounding recovery from alcohol addiction. David Penner has extended our work enormously by designing and testing his Seven Principles course, which seems to be in great demand.

Our collaborations with Julia Babcock and Patty Warford are extending our work in domestic violence. Our collaboration with Paul Peluso is extending the math model to individual psychotherapy, and to helping couples recover from an extra-marital affair. We are hoping that our collaboration with Bernet Elzinga at the University of Leiden will extend our work to bipolar patients and their partners.

My continuing collaboration with the extremely talented writers Joan DeClaire and Nan Silver has borne fruit in being able to communicate to the public concepts that might have just remained in academic journals. Julie Gottman has also enormously helped polish the sloppy slapdash writing I produce. She is a born writer.

As our work becomes increasingly international, there have been therapists who have taken our work and modified it to suit the cultures they represent. Christina and Peck have done amazing things in South Korea. They do us a great honor, and they are changing Korea in brilliant ways. In Australia, Sophie Havighurst has done three studies to date with emotion coaching, and shown the power and universality of an intervention that emerged from families in the USA. Relationships Australia has brought us out to train therapists throughout that great country. Christina has done the same in Korea. Children are the same everywhere on the planet. In Turkey, the two astounding women, Filiz Kaya and Ozge Altan Aytun, are selflessly changing the nature of relationships in Istanbul and beyond. In Japan, Yuri and Hiroshi Morikawa brought us out recently to do a couples workshop, and they brought David Penner out in the same trip to train course leaders in his Seven Principles course.

I would also like to thank my steady sources of research funding, the National Institute of Mental Health for grants and a 20-year Research Career Scientist Award, the Kirilin Foundation, the Talaris Research Institute, Mathematica, and the Federal Administration of Children and Families. Research is an expensive and slow enterprise, and these patrons make it all possible. It is getting harder and harder to obtain funding for this relationship work in the United States, and without these far-sighted private patrons, we would unfortunately simply have had to stop long ago.

So many people contribute to make an effort like this possible over so many years, and without question the greatest of all these contributions are those of our valiant research subjects, who volunteered for the sake of science and helping others. I am forever grateful to them.

John Gottman,
Orcas Island, Washington

CHAPTER 1

A Science of Love? Really?

Omne ignotum pro magnifico
(“Everything unknown passes for something splendid”)
—Tacitus, 98 AD

Can we really build a science of love? Is love something that we can actually examine under a psychological microscope? The early great psychologists of the 19th century brought to psychological questions methods of systematic, unbiased observation and measurement. These methods were developed by animal psychologists and behaviorists who focused exclusively on observing *behavior*.

These early scientists in the emerging field of psychology claimed that the first task of science was description and good measurement. Their advice: Observe, describe, measure, and find patterns that replicate over studies. Then try to discover the principles that organize these patterns. So, with that history of psychology as a legacy, we all began bringing love into a laboratory.

However, my life-long colleague Robert Levenson and I were not limited to studying just behavior. We also include self-reports of experience, and human physiology. But our first task was simply to describe. Then our second task was to find replicable patterns. The third task was prediction over time. The fourth task was to understand that prediction, and build a theory. The fifth task was to use that understanding to help couples have successful love relationships. The accomplishment of these five tasks took many scientists—not just our laboratory—over four decades. Now we can share this good news with the world. What were the beginnings of this field of understanding love? It all began when two scientists recorded the conversations of one newlywed couple on their honeymoon.

RECORDING A COUPLE’S HONEYMOON

In the 1960s, two researchers, William Soskin and Vera John, inadvertently started a revolution in our ability to study love. They recorded one couple on their honeymoon. The couple had to wear huge expensive backpacks even when rowing on a lake to record their conversations. The backpack contained a radio transmitter that sent a signal of their conversation back to a control room so that all their conversation was recorded on audio tape.

Then Soskin and John transcribed every word the couple said to one another, and categorized every sentence, a process they called “coding,” using a complex category system. Here’s a clip of Roz and Jock’s conversation as they row on a lake resort:

- Jock: Come on! Yo ho, heave ho. You do the rowing.
 Roz: Nuts to that idea. You’re the big, strong man. Mmmmm.
 Jock: Yeah, but I have a handicap.
 Roz: Yeah, you have a handicap in your head.
 Jock: (to attendant) Can we take out a boat? (They get a boat.)
 Roz: Whoops! Don’t get wet. You row for a while and then I’ll row. Okay?
 Jock: All right. It’s awkward rowing with the transmitter on.
 Roz: Go on. Want me to take it while you’re rowing?
 Jock: No, it’s okay.
 Roz: Bet you don’t know how to.
 Jock: Oh, yes I do. I guess I just ...
 Roz: Here, let me change.
 Jock: I’ll just have to set this thing out here.
 Roz: Let me take it.
 Jock: Okay. It’s really a clear lake, isn’t it?
 Roz: It’s wonderful. Look, there’s a big moth. I wish I had my book with me, then I could tell what kind it was.
 Jock: (handing off the transmitter) Here, put it on.
 Roz: Like this? I wouldn’t want my speech distorted, since I usually have so much to say.
 Jock: Aren’t *those* cabins nice?
 Roz: Yes, those are the ones we were supposed to be in. I keep telling you.
 Jock: These there? Look how dark the water is down there.
 Roz: You tip this boat over with me in it and I’ll be very upset. Uh, uh, huh, huh, huh, huh (chuckling).
 Jock: I just felt the ...
 Roz: (laughing) Jock, I just made a joke. Have you no sense of humor?
 Jock: Look how ...
 Roz: Why are we going way out in the middle? I’ll get sunburned.
 Jock: What difference does it make whether you’re in the middle or not?
 Roz: You get more reflection in the middle.
 Jock: (scoffs) Oh!
 Roz: Jock, I *know!*
 Jock: How do you know?
 Roz: I can see! You put on your sun specks before you get a headache, huh?
 Jock: No.
 Roz: No? Okay. Wanna take your shoes off?
 Jock: No.
 Roz: (taunting in a sing song way) ... Ah, Jock’s gonna be sore tomorrow because he insists on showing off. (Jock rocks the boat intentionally.) No! Now cut that out! You’ll ruin this \$50,000 equipment.
 Jock: Oh, look. Boy these are nice oars.
 Roz: You’re a good rower, honey.

Soskin and John asked themselves, “How does one scientifically ‘analyze’ these naturally-occurring conversations of these two people?” As a response, Soskin and John created a very complex set of categories (called a “coding system”) for every one of Roz and Jock’s utterances. It took an enormous amount of time to categorize these utterances, and then to search for patterns in their data.

After all that “coding” work, they were mightily disappointed in the results of their analysis. They felt that these analyses totally failed to capture the complexity of this couple’s relationship, that their coding just didn’t capture the richness of the actual data. They concluded that the problem was that their categories for coding all this conversation by Roz and Jock had ignored both emotion and power. They felt that they really couldn’t capture the playful teasing and the challenging contempt that Roz and Jock displayed in this clip, the attempts at control by Roz, and Jock’s resistance to being controlled, nor their repair in the last two lines at the end of this clip. Soskin and John wisely concluded that future coding of naturalistic conversations that a couple has should include emotion and power. They were right about that. That, in fact, was where we started, trying to describe the emotions.

OBSERVING LOVE: NEW METHODS MATERIALIZED

Although sociologists had been studying marriages since the 1930s, the use of *observational methods* was what we psychologists initially brought to this field. These sociologists had succeeded in accomplishing the huge task of defining, and reliably and validly measuring, relationship happiness in married couples. That difficult task took from 1938 to the mid-1950s. The accomplishment was an enormous advantage for us psychologists, once we started studying relationships in the mid-1960s.

By the early 1970s, psychologists who did therapy with families entered the fray, searching for what to observe in couples. The new technology of portable videotape made this process much richer. The intuitions of clinical psychologists led to many of the new breakthroughs. The therapists who began doing therapy with families taught us to focus on *communication*, on messages received and sent in just one interaction, and on the couple as an interacting system.

The decade of the 1960s had witnessed an outpouring of new writing by social workers, psychologists, and psychiatrists who were discovering new patterns in doing psychotherapy with couples and families. Instead of relying on narrative accounts of relationship events, they were observing these events in action.

Those insights were aided by breakthroughs in how to study nonverbal behavior, and emotion, particularly insights about the face that came from Paul Ekman and Wallace Friesen at the University of California at San Francisco. Inspired by Sylvan Tomkins, they and Carroll Izard taught us how to study emotions in the human face, in both adults and children.

Ekman and Friesen picked up on Darwin’s 1872 study of emotions, and created a new coding system that precisely described the motions of over 46 facial “actions.” They showed us how to study facial movement anatomically, and how to interpret facial movements to understand the universality of human emotions everywhere on our planet. They reversed the initial misleading declaration in the 1950s by the famous cognitive scientist Jerome Bruner that the face was a researcher’s nightmare, and not worth studying. Instead of a nightmare, Ekman and Friesen showed that it was a goldmine.

Being able to code and interpret facial expressions was just one gateway toward understanding emotion. Knowing what else to code in couple's interaction was initially a huge challenge for the scientific study of couples, and it took scientists over 20 years to empirically learn what to observe in couples' interactions. Once we knew how to code emotions in the face, in the voice, in the body, and in language, we were off and running. A new era began once sophisticated observational methods began to be devised by psychologists like Gerry Patterson and Robert Weiss. We couples researchers also learned a lot from the scientists, such as Harry Harlow and Jim Sackett at the University of Wisconsin, who studied non-human primates.

Once the initial huge problems of measurement were solved, new methods also had to be developed for *analyzing* this rich stream of observational data from two interacting people. This mathematics of the new field was christened "cybernetics." It had been developed by M.I.T. mathematician Norbert Wiener during World War II. Wiener was part of a project to develop the new math as part of the task of designing an anti-aircraft gun that could anticipate and follow its target (instead of throwing up an array of flak, and hoping an airplane bumped into it). The new math all had to do with observing events unfold over time, a field christened "time-series analysis." A "time-series" is a graphical plot of a variable over time. Just as the Dow Jones industrial average tracked the stock market, we could track a conversation between two people using two Dow Jones graphs of a conversation. Every morning daily newspaper had examples of these stock market time-series graphs.

With time-series analysis, we could search for rhythmic patterns during conflict. French mathematician Jean Baptiste Fourier had proved an amazing theorem in 1822 that helped us see the wave nature of patterns that repeated over time. Using the new methods of time-series analysis, we could now quantitatively assess how interconnected two people were. We could even assess the connection between two people's hearts. Statistician James Ringland and I worked out a statistical test for making causal inferences in two time-series, one for each partner. Using time-series methods that Gene Glass and Victor Wilson and I developed in 1973, we could also assess whether specific events preceded significant changes in a time series. Therefore, by the early 1980s a whole new technology for analyzing time-series patterns could be brought to bear on this task of bringing love into a laboratory and watching lovers interact.

But, what if the sequence of data was just a series of *categories*, like "Roz-angry" followed by "Jock-angry," rather than continuous numbers as in the Dow Jones average? How would these data get analyzed?

The answer lay in Claude Shannon's information theory, developed in a small monograph published in 1949. Shannon was actually a student of Norbert Wiener. The vague concept of "information" was now defined precisely in terms of the statistical reduction of uncertainty. It took 25 years for Shannon's information theory to be applied to the study of couples' interaction. A brilliant clinician and scientist named Harold Raush applied the new mathematical "information theory" techniques Shannon had devised during World War II. Raush conducted a groundbreaking longitudinal study at the National Institute of Mental Health of couples having their first baby.

Finally, because of Raush's pioneering study, our analytic techniques could match the subtlety that Soskin and John could not capture in Jock and Roz's honeymoon talk. Now, instead of merely tallying how often some observational category each partner occurred in the interaction, we could (for example) describe how Roz *tended to react* when Jock

challenged her knowledge. We could describe these *probabilistic sequences* in transitional probabilities. That means that we are not saying that that Roz would respond to Jock that way *every time*, but just more likely than chance alone would predict. We talk about *reducing uncertainty* in what Roz might do next by knowing what Jock had just done. If our prediction of Roz's doing behavior Y, once Jock had just done behavior X, was significantly better than her overall probability of doing behavior Y, then that's all we needed to determine to get the probabilistic sequence *Jock X* → *Roz Y*. This is what we need to do to detect statistical patterns of sequences in our data.

We could also build longer, and much more interesting, sequences. In information theory we now had our basic tools for describing what *patterns of behavior* were in Roz and Jock's and other couples' data. Statistical tests could then be devised to ferret out sequences in Jock and Roz's codes. This idea of *probabilistic* sequential pattern was an enormous conceptual advance in understanding interactions between two people. And our field owed it all to that World War II project developing a more sophisticated gun. Now, with information theory and time-series analysis, we could detect complex sequences that actually captured the complexity of a couple's interaction. We were off and running, with observational techniques and analytic tools to match the richness of what we were observing in our labs. If we found patterns that characterized unhappy marriages (a big "if"), and if we then found different sequences that characterized happy or stable marriages (another big "if"), then we could see if these results replicated, and if they did (another big "if"), then we could try to explain these patterns. We had the tools now. We just needed the data.

Yet, big problems emerged. The amount of data we generated in one study was simply overwhelming. For example, if we had only 40 codes for each partner's behavior, in just two-step sequences we had $40 \times 40 = 1,600$ possible two-step patterns. In just three-step sequences we had 64,000 possible patterns! How could we ferret out the dance in which Roz and Jock were engaged? We would need massive amounts of data to have any statistical test that didn't just capitalize on chance alone. Yikes!

A gifted primatologist and methodologist named Jim Sackett figured out elegant ways of detecting sequences in our coded data of two people interacting, called "lag sequential analysis." Sackett's methods helped us deal with the data-overload problem created by examining sequences. My colleague Roger Bakeman also led the way, designing computer programs (like "ELAG"), helping the emerging field deal with the data-overload problem (see also an important 1982 paper by Allison and Liker). Bakeman's own work focused on mother-infant interaction, rather than couples. My own math background helped me to participate in developing some of the new methods Norbert Wiener had pioneered, particularly ways of studying interaction as two time-series. Many mathematical techniques had been developed to study these kinds of data, and they could then be applied to study couples.

A wild flurry of observational research studies followed, in the USA by Robert Weiss, Gerry Patterson, Gayla Margolin and Bruce Wampold; in Germany by Kurt Hahlweg and Dirk Revenstorff; and in Holland by Caas Schaap. Much to our great surprise and delight, in the 1970s and 1980s all these labs started converging on very similar findings about the differences between happily married and unhappily married couples. New therapies trying to help unhappily married couples were also then launched and tested. Most of these therapies were premature. Many of them were dead wrong. Some of them were on the right track.

OUR EARLY ATTEMPTS AT UNDERSTANDING LOVE

My students and I video recorded the course of many relationships, some deteriorating over time, some remaining happy and stable. We developed a wide variety of coding systems. We looked at tapes over and over again, and we scanned our data for patterns.

I want to point out that while we psychologists in this new field of couples' interaction observed and analyzed, we were not detached observers. As a clinical psychologist as well as a child psychologist I deeply felt the pain and tragedy of these ailing love relationships. Starting in graduate school at the University of Wisconsin I had been doing psychotherapy with many couples just like these couples, to try to understand what had gone wrong in their marriages.

I was drawn to this field for very personal reasons. When I was a child of eight my dad of beloved memory took me and my baby sister for a walk in a Brooklyn park. He told me that he and my mother might be splitting up and that I might have to decide which parent I wanted to live with after the divorce. I remember how stunned I was by what he was saying. After being silent for a while, I recall getting very angry with him. I told him that I was just a child, and I couldn't possibly make these kinds of decisions; that I loved them both, but *they* were the grownups; that *they* had to work out a way to stay together and keep loving one another, and do the thinking for the two of us kids. He got very quiet after that, and I know that I heard them argue with one another many nights when they thought I was asleep. I was very worried. But they worked it out. They stayed together more or less happily for 49 years, until he died at the age of 76. We then moved my mom of beloved memory to Seattle and we had her with us for another 13 years.

So the pain of relationship conflict and discord is very real and very personal to me. I want my life to make a difference to people everywhere who are trying to make love last a lifetime, and to the children who depend on these parents. I myself had experienced many failed relationships before I finally met the love of my life, psychologist and therapist Dr. Julie Schwartz, in 1986, not long after I moved to Seattle.

However, even though what we were studying was very personal, we all needed to be objective scientists. It was altogether too easy to be guided by clinical intuition and wind up building only a house of cards. Many smart people before us had done exactly that.

SISTER KENNY OR JONAS SALK?

One year at the University of Illinois, the clinical psychology graduate students were in revolt against the faculty. I was then a professor of clinical and developmental psychology. It was a great psychology department in a truly great university; it was really a fun place to teach and do research.

But the grad students in clinical psychology were fed up with the research emphasis in our training program. They couldn't wait to get to the job of helping people. They wanted less research and more direct therapy experience. Their feelings were totally understandable. Some students said that they had only emphasized wanting to do research on their applications just to get accepted for admission. Others said that they had been interested in research but no longer were. They demanded change now.

Coincidentally, we had a visitor named Ed Katkin, a clinical psychology professor, giving a colloquium. Katkin was an accomplished scientist who used psychophysiology to study a variety of topics. Katkin was also an amazing man. He was working at Attica Prison when the riots occurred. He heard about them on the radio driving toward Attica. Instead of turning around and going home, Ed drove to Attica to see if he could help. He was not only a fine scientist, but also a dedicated clinical and community psychologist.

Katkin had gone out to lunch with the angry grad students and his affable manner had won them over. They trusted him. In a subsequent meeting in which some faculty and all the grad students were present, the students felt encouraged to complain to Katkin about our program. They decried the research-oriented program and said it was somehow “cold” and not “humane.” They wanted to heal people, not be stuck somewhere in some ivory tower laboratory.

Katkin replied with a story. He said that in his day the polio epidemic swept the United States, peaking in 1952 with 58,000 cases. It was the most frightening pandemic to infect the post-World War II United States. Katkin said that in the 1950s there was a foundation called the Sister Kenny Institute, which followed a very dedicated nun named Sister Kenny. Thousands of volunteers went to the houses of polio-stricken children and used hot packs and massaged the children’s limbs. It was a great improvement over the then current practice of immobilizing the children. Katkin said that these volunteers were warm, caring, dedicated people who believed in what they were doing. They all wanted to help the stricken children.

However, while all their efforts certainly helped the families of polio victims feel more hopeful and less alone, their efforts did nothing to end the disease. In 1955 the Salk vaccine was introduced, and the polio epidemic began to see a final end in the USA. Jonas Salk had cured polio after endless hours in a laboratory. Katkin then said that he would rather be Jonas Salk than 10,000 Sister Kennys.

He said that as “true clinicians” all of us were trying to understand and help prevent and treat psychological problems and disease. But, he added, it was important for us to learn effective therapies, and to develop new therapies that were proven effective. Most psychotherapies out there, he said, were just as useless as those caring people who massaged the paralyzed limbs of polio victims. The students needed to decide who they would rather be in their careers, a Sister Kenny or a Jonas Salk.

That event was memorable for me, because Ed Katkin expressed what I couldn’t to these students: that my passion was to understand the tragedies of failed relationships, to understand the dynamics that made relationships either work well or fail miserably, and to use that research to help—not to massage, but to cure.

Of course, finding the right kind of help proved highly elusive. Robert Levenson and I discovered in our longitudinal research that if a couple got any kind of psychotherapy for their relationships, individual or couples therapy, that they were more likely to get a divorce than couples that received absolutely no therapy. That was true even controlling for how distressed the couples were who got no therapy or some form of therapy. Clearly most couples therapies were doing something wrong.

Very smart clinicians were writing book after book for the general public about what went wrong in ailing relationships. All their advice sounded eminently sensible. But none of it was based on any research at all. As it later turned out, almost all of these recommendations by very smart and very caring therapists, people who dedicated their lives to

healing psychological pain, were just plain wrong. Mostly these really smart and intuitive people weren't just a little wrong. They were all totally wrong.

HOW OUR BEST AND BRIGHTEST CLINICIANS TRIED TO UNDERSTAND LOVE

To give you some idea of the state of the art of couples therapy at that time, there was a book written by Dr. George Bach called *The Intimate Enemy*. Dr. Bach claimed that the problem in relationships was that people suppressed their resentments. So his therapy consisted of a couple facing one another and taking turns stating what they resented about their partner. He even provided foam-rubber bats (called "batakas") that they whacked each other with as they took turns stating their many resentments, accompanied by a "bataka-whack." Then they wrote Dr. Bach a check.

I remember reading *The Intimate Enemy* and envying Dr. Bach. He had a bestseller on his hands. He had created a penetrating analysis of relationships based upon his extensive clinical experience. He would now become famous and he'd get to go on a book tour, and be celebrated on radio and national TV. Just maybe he had made a therapeutic breakthrough just by the strength of his intuition. I wanted to be like Dr. Bach, but also collect data.

After hundreds of social psychology experiments, we finally learned that if you do what Dr. Bach recommended as therapy for an hour, clients would leave even more resentful than when they started. It turned out that, contrary to popular intuition, there simply is no catharsis effect for anger. To learn more, read Carol Tavris' wonderful book, *Anger: The Misunderstood Emotion*. Dr. Bach wasn't unique at being totally wrong about anger and couples. Being a smart clinician wasn't enough to get it right.

Another famous book, called *The Mirages of Marriage*, written by a very respected and brilliant therapist, Don Jackson (Lederer & Jackson, 1968), claimed that what goes wrong in marriages is that people fail to reciprocate positivity. He called it a failure of "the implicit quid pro quo" contract that was the basis of all marriage contracts. "Quid pro quo" means "something for something" in Latin. The implicit contract is that if I do something nice for my wife, she is obligated to reciprocate by doing something nice for me. Whether we know it or not, whether it is explicitly stated or not, that, they claimed, was the basis of all marriage contracts the world over. If it were right, what a brilliant insight! It was so simple, so fundamental, it just had to be true. Their book became an immediate bestseller. I recall that I also envied Don Jackson. I loved the title *The Mirages of Marriage*. Brilliant.

Although these authors had absolutely no data for their hypothesis, it inspired behaviorists to immediately develop a new form of couples therapy called "reciprocal contingency contracting." It actually inspired therapists everywhere, not only behaviorally-oriented therapists, with its clear and incisive advice. I wanted to be Don Jackson. In the therapy behaviorists recommended the couple negotiated a contract exchanging what each wanted from the other. That was the therapy. Papers were published in professional journals in which, for example, he would agree to take out the garbage on Friday morning in exchange for fellatio from her on Friday night. I'm not making this up. This new couples therapy, "reciprocal contingency contracting" spread like wildfire through the couples therapy community. Soon almost everyone I knew was doing that kind of couples therapy.

It wasn't until 1977 that Bernard Murstein showed that in both marriages and friendships, quid pro quo thinking was actually characteristic of *ailing* relationships rather than happy ones. In happy relationships people simply give without expecting a return. Murstein claimed that his data showed that we don't become emotional accountants until the relationship has first already gone very wrong. Other behavior therapists like Richard Stuart also began criticizing this "give to get" therapy.

It took us a long time to realize that relationships in which people negotiate what they want from a pure position of self-interest are inherently dysfunctional. But no one really knew *why* that was the case. Only much later, once it became possible in my lab to compute a "trust metric," did the answer to the fundamental flaw in these therapies emerge. That quid pro quo model of relationships was characteristic of relationships that had a low level of trust. In a high trust relationship we can count on our partner to have our best interests at heart, not only their own. Our partners "have our back." They simply operate considering our best interests. Trust makes relationships easier because we can operate with incomplete information. Negotiations from positions of self-interest are exhausting.

Just recently, theories began emerging to understand the reliable phenomena of love relationships. Empirical research attempting to understand happiness or misery and attempting to predict the future of relationships showed that emotion was clearly the place to look. Once we learned that, it became clear that our therapies needed to change. They couldn't be purely behavioral or cognitively rational. They had to make emotional sense.

One of my heroes in life, Dr. Susan Johnson from Ottawa, Canada, realized the importance of emotion. While a graduate student at the University of British Columbia in Vancouver, she drove down to Seattle often, to attend my colleague Neil Jacobson's lab. Neil had developed and tested one of the first effective couples therapy programs, based entirely on behavioral principles. Johnson intuitively knew that this therapy would have significant limitations.

She began developing a couples therapy based entirely on emotion, and she began showing that her Emotionally Focused Couples Therapy (EFT) could help couples renew their relationships. She based her therapy on research, and on her astounding intuition, and also on Dr. John Bowlby's attachment theory. Bowlby's theory highlights the importance of safe and secure love bonds within a relationship. Bowlby had seen the tremendous power of mother-child attachment when 700,000 children were moved out of London during the Nazi blitz. Although these children were placed in normal, loving homes, many of them failed to thrive because they needed their mothers. Bowlby's insights were highly controversial until Harry Harlow demonstrated their validity with infant rhesus macaque monkeys at the University of Wisconsin. Bowlby's collaboration with researcher Mary Ainsworth also demonstrated the power of the attachment bond.

Johnson started applying Bowlby's ideas to adult love relationships. Since then, adult attachment has become a burgeoning field in social psychology. In Johnson's analysis, most conflicts in a love relationship have a much deeper explanation, one characteristic of the human condition: the desire to bond meaningfully with another. Many conflicts in a love relationship engaged this terror of being alone or of being rejected by someone we care about very deeply.

Contrary to an individualistic approach to couples therapy, or a behavioral therapy based only on *negotiation from positions of self-interest*, Johnson revealed the deep longing people have to be connected in love. She claimed that dependency was not

pathological—as is suggested by pejorative terms such as “fusion” or “enmeshment”—but that dependency was the human condition. She quoted Bowlby as having said that in life there is only effective and ineffective dependency. Johnson was a trailblazer.

Her couples therapy was a dramatic turnabout from behavioral couples therapy. Instead of a relationship therapy teaching couples to *negotiate the best deal each person could get* from positions of self-interest, EFT was based on building trust and creating compassionate understanding of people’s most basic need, the need for connection. Instead of looking out just for one’s self, EFT was also based on looking out for one’s partner’s emotional well-being. Building trust, she noted, is about knowing that your partner is there for you, and has your back. That’s what builds secure attachment. Not negotiating from positions of maximizing self-interest. That point of view converges with my own work on trust.

Johnson’s work on emotion in couples’ therapy and our basic research and intervention work formed a remarkable convergence. In treatment, she led the way. Furthermore, it was not just intuition that guided her. She carefully evaluated her therapy in state-of-the-art randomized clinical trial studies. She also studied her treatment failures, and modified EFT as a result of her “process” investigations. Today EFT is a highly recognized and effective couples therapy method.

Many decades before EFT emerged, Robert Levenson and I began our basic research on couples not realizing that many of the books on couples therapy were written by therapists, who, of course, saw only unhappy couples. We didn’t realize that it would be a contribution to couples therapy just to observe happy, as well as unhappy, marriages. Our samples, rather than using extreme groups, employed uniform samples throughout the happiness spectrum, from marital happiness to complete misery.

Of course, even our best therapists, experiencing, as they do, only ailing relationships, would have to *imagine* what a good couple’s relationship looks like. Therefore, the goals they had for couples therapy had to come only from their imaginations, not from real data. If you have the wrong goals for the therapy, you may be trying to improve your therapy, perhaps making it faster and less expensive, but you could be rushing headlong toward a cliff. Having the right goals for couples therapy really matters.

But how does one scientifically *discover* the goals of couples therapy? The answer, my thesis advisor, Richard McFall, thought, was an idea proposed in a 1969 landmark paper by Goldfried and D’Zurilla, both of the University of New York at Stony Brook. McFall made sure that we all read that paper in graduate school. That paper has guided all of my research. Goldfried and D’Zurilla suggested that it makes sense to discover clinical interventions by studying how the “masters” dealt effectively with problems that the “disasters”—the clinical population—had yet to solve. What a great idea! That idea became the basis of my whole life as a scientist.

Of course, there are a lot of assumptions in that idea. Are the disasters of love all alike? If not, are they even classifiable? Tolstoy in *Anna Karenina* claimed that all happy families are happy in the same way, but that each unhappy family is miserable in a unique way. Was he right? Are there really “masters” of love relationships? Are they similar enough that we can describe what they do differently from the disasters? Are the disasters all different from one another, or do they have some things in common? How universal are these similarities within the masters, within the disasters? Do same-sex couples have these same differences? Does all this vary across the life course? Does it vary across cultures, or are these differences between the masters and the disasters universal?

So, in 1972, at Indiana University, I set up a lab to do this basic research on the masters and the disasters of love. In 1978, Robert Levenson and I started collaborating. Even before Robert Levenson and I started collaborating, I was encouraged by our initial findings of how happy and unhappy couples were different, especially the finding that these differences replicated in widely different samples. That was extremely encouraging. I built a device I called “the talk table,” that had each partner evaluate the “intent” of a message sent, and the “impact” of a message received. We also coded the videotapes of the couples’ verbal and nonverbal behaviors. That device made it possible to use game theory ideas to test many ideas that had yet to be tested on how happily married and unhappily married couples were different. Our first study was with married couples affiliated with Indiana University. Our second study was with couples from rural southern Indiana, a world apart. Not only did we discover significant differences, but also those differences replicated with very different samples.

Based on these differences, my students and I designed a randomized clinical trial intervention in 1976. My goal was to help these couples using early results from my lab. That intervention program got large results, so we were very encouraged. However, just one year later most of these couples had relapsed. What a huge disappointment. Later, it turned out that Neil Jacobson, who developed an effective behavioral couples therapy, also reported 30 to 50% relapse after 2 years with behavioral marital therapy.

Yet, my intervention study wasn’t a total waste. Later, my former very ambitious graduate student, Howard Markman, used that very program (published in our book *A Couple’s Guide to Communication*) as a basis for *preventing* divorce in engaged couples, a program that he called “PREP.” PREP turned out to be a highly effective program for prevention of discord, and Howie developed it further at the University of Denver with Dr. Scott Stanley. Prevention was apparently a lot easier than intervention.

Still, the relapse I got in our therapy program was disappointing. It was part of the reason why I had teamed up with Robert Levenson in the first place. I thought that we had to go back to the drawing board to study couples’ *emotions* in more detail, especially using physiology, that hidden, invisible part of emotional responding. Our basic research on emotion in couples eventually led my wife and I to create a new couples therapy program that has demonstrated remarkable convergence with Dr. Susan Johnson’s Emotionally Focused Therapy. We recently conducted a large “summit” meeting in Seattle with 1,200 clinicians, in part celebrating and talking about that convergence.

HOW THE LEVENSON–GOTTMAN LAB STARTED

Over 40 years ago, when I was an assistant professor of psychology at Indiana University, I met my colleague Robert Levenson, who was to become the best man at my wedding to Dr. Julie Schwartz Gottman 26 years ago. Robert and I became friends very quickly, because we deeply shared a very black sense of humor. I must admit that, back then, Robert and I were somewhat clueless about relationships, and our relationships with women were not going very well. So we decided to do a study of relationships, hoping we might discover some good advice from the happy marriages we studied.

By that time, I had already been studying couples for 4 years and discovered that *emotion* was the most important place to look when examining what made couples happy or unhappy—not only emotional behavior, but the perception of emotion proved important. Robert and I were both interested in emotion, and Robert was a