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Jerome Premmereur

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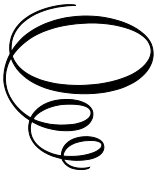

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To Didier Anzieu, a combination of such high levels of rigor, resilience, and creativity.

To Christine, Juliette, and Emile, who patiently suffered my "Spinozism" for decades. With all my gratitude and love for their tolerance.

To Celine, and her ongoing eternal essence.

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INTRODUCTION

"Thinking is what gives human matter its shape. The individual must die so that this form continues to take shape in other forms, continues to be transmitted alive in other humans."
—Didier Anzieu[1]

I have begun a project which, I believe, is unlike any other. The goal is to propose potential solutions for the problem of human radicalism. My unique perspective stems from human nature being reviewed through the lens of biological and philosophical terms, specifically integrating the philosophy of Baruch Spinoza and 21st century molecular biology/medicine. This novel combination creates a particular vision: the "Spinozist" approach to human nature and radicalism.

The COVID-19 pandemic illustrates the hypothesis well. The contentious debate over vaccinations went far beyond medicine and science. This societal debate was not just about the stereotypes of scientifically grounded vaccine advocates against ignorant religious fanatics. Indeed, it reflected a much more radical agenda often propagated by politicians and conspiracy theorists against experts publicly learning in real time how to manage a pandemic of the novel SARS-CoV-2 virus. A few years into the pandemic, we are left with a traumatized society with deep consequences for psychiatry and social structures. A US study[2] of 187.5 million emergency department visits revealed that the rates for mental health conditions, suicide attempts, drug overdoses, and child abuse and neglect have increased markedly compared to the pre-pandemic period in 2019. Furthermore, during the pandemic, a stunning societal change occurred with more than 24 million US workers quitting their jobs and exiting the labor force.[3] The same trend has been observed in China, Japan, and Europe, showing a marked deterioration in mental health and quality of work life. These unfortunate events are a clear illustration of Spinoza's idea that the miseries of the human condition are created by our enslavement to our affects and passions. Spinoza's ontological argument was that the complexion of being, of existence bound to the universal laws of nature, was much more visible. Once again, as part of a long series in human history, such a condition was sadly illustrated.

After more than a year of vaccines being available, roughly one in four Americans and Europeans still do not want to receive the very efficient and safe COVID-19 vaccines, despite the positive benefit–risk ratio. In contrast, the worldwide vaccination uptake in terms of dose numbers administered was very positive news. In just 13 months, the number was over 10 billion, far above any vaccine experience in human history, and a higher number of doses than the total number of humans around the world. Seven vaccines were broadly available and were able to be produced in the billions. Despite this, the duration of the pandemic, and therefore COVID-19 morbidity and mortality levels, was disturbing, showing a huge disparity between countries and between rich versus poor populations. Consequently, a huge number of people, including government-elected officials and/or educated citizens, have lost their trust in medical science. It is incomprehensible that after the pandemic has already killed so many millions, people still opt against taking the highly effective vaccines that have been proven to protect them against deadly disease.

The mark of the COVID-19 pandemic could be seen in the political confrontations and divides within many countries. One component among the very large number of unvaccinated people, at least in Europe, China, and the USA, was the extremely politicized debate of this public health issue. This sociological disaster spilled over to mask wearing, which was also judged by political affiliations regardless of efficacy. While the distance between people, mask wearing, and hand washing have similar impacts to vaccination, "freedom" was viewed as a higher priority than the risks posed. The appraisal of the protection was perceived by many to be a personal threat to individual liberty. These phenomena do not make any ethical or scientific sense. "Reason," in its traditionally accepted form, was excluded from the debate. Radicalism was a widespread premise, and violence was the rule.

For many experts, their scientific positions were and are very difficult. For instance, one US political party decided officially to organize the debate for the 2022 congressional mid-term elections around attacks on the director of the US National Institute of Allergy and Infectious Disease (NIAID), who had served eight presidents (Republicans and Democrats) since 1984 and had no known party affiliation. In the past, the main target for this party had been the elected speaker of the US House of Representatives, which is the traditional political route to gaining seats. In other words, the target is typically a political figure. This time, however, the political party anticipated a more favorable outcome by scapegoating the NIAID director,[4]

who was outrageously compared to the brutal Nazi doctor Mengele by some voters.

This specific segment of radicalized society focused in on tearing down the integrity of the NIAID director, not due to the veracity of any of the reported facts, data, or evidence that they communicated but on the political view of the consequences of the inconvenient "truth" for voters. The scientists were being challenged as though they were a "political" person. Researchers and experts have become politically polarized. Worldwide, scientists who were favorable to vaccines and masks were bullied for those "positions" during the pandemic. The experts' assumptions about their job description are: "Tell the truth and make recommendations based on data and evidence." They were disgracefully challenged with a high level of violence akin to the terrorists arrested after the 2015 attacks in Europe, who used the same methods to challenge judges and any established power in the name of "sharia."[5] Thinking like a cult member, political leaders were the only gurus whom one could trust. The aims and methods of terrorists and radical COVID activists look the same: to fracture society through a latent war. As in the darkest hours of the Islamic State in Syria, where the members of this organization translated, dissected, and analyzed the slightest reports of Western television to take advantage of the errors made,[6] the various skeptics on vaccine science questioned the values of these experts to sow doubt into the minds of their fellow citizens. The fact that the well-known nonpolitical director of the US NIAID needed protection for himself and his family was a safety signal for scientists around the world. The feeling generated was akin to the threat of a terrorist attack. Somebody that you had never met, with no potential discussion or argument with you, wants to kill you for doing your job. At the beginning of the pandemic, Dr. Li Wenliang, an emblematic physician who raised the alarm about the devastating coronavirus, was persecuted by the Chinese police who accused him of spreading false rumors. He died later from COVID-19.[7]

This painful period is covered in the last section of this book. The pandemic offered a perfect platform for Spinoza's three kinds of knowledge. Using his terminology, the beginning of the COVID-19 pandemic, around the first half of 2020, was the "first kind." It describes the affects/passions resulting from the effects of the pandemic at the individual and social levels. Assumptions on the origin of the virus, on the reality of the threat, and on the efficacy of drugs or some extravagant strategies were circulated and generated deleterious outcomes. It was "inadequate" knowledge because it led to deaths and heavy morbidity (such as three weeks or more in an artificial coma and respiratory assistance in hospitals) for millions of

people. Unfortunately, the first kind of knowledge precipitated and largely aggravated the pandemic. It was very well demonstrated by countries that were outside of this radicalistic paradigm. The outcome operates within the field of radicalism driven by Spinoza's idea of affects.

After this period, the understanding of the virus, the disease, and the variant structures were in the scope of the "second kind" of knowledge. This was more positive and adequate because it elucidated a large part of the causation. This second kind of knowledge was geared toward protecting us and included preventative actions, vaccine expansion, and treatments. It was based on the understanding of the causality, not on the effects, of the pandemic on people. It included knowledge of the virus and how it operated in the human body before, during, and after infection. This second kind of knowledge influenced the actions of billions of people who decided to make logical choices to protect themselves.

The surprising Omicron family of variants that emerged in 2021 demonstrated that we did not have access to Spinoza's "third kind" of knowledge, which is an understanding of the essences. Essences, as applied to COVID-19, is the field of comprehension about possible SARS-CoV-2 viruses in nature, looking at such topics as what configurations are possible in the essence of the virus and what would be the knowledge of potential expression of the SARS-CoV-2 virus evolution. According to Spinoza's philosophy, the right answer would be the knowledge of the essences. This deeper understanding would have led to better management of the end of the pandemic, as the Omicron variant of the virus could have been anticipated. This is what experts do every year for the flu virus variants, anticipating strains for the next season. When those professionals succeed, which is relatively often, the morbidity and mortality of the seasonal epidemics of the disease are much more positively impacted by the dedicated vaccine. Knowledge of the existing circulating viruses combined with the phylogenetic tree (evolutionary relationships among viruses) give some understanding of the essence of the flu virus.

During the first quarter of 2022, the genomic epidemiology of the SARS-CoV-2 virus finally began delivering clues (around 3,200 genome samples classified by families and locations and organized within a phylogenetic tree). Unfortunately, two years after the start of the pandemic,[8] it was not possible to forecast the arrival of the Omicron variant. The application of "Spinozist biology" to the lessons of the COVID-19 pandemic story is a great introduction to this philosophy. Similarly, this book intends to outline imperatives to deradicalization. It all starts with Spinoza's philosophy, far

before and beyond the COVID pandemic, which is just one illustration amongst many.

The term "radicalism" merits clarification. As used in this book, radicalism is defined as the process whereby individuals or groups develop, over time, a mindset that can increase the risk that he or she will engage in violent extremism and/or terrorism.[9,10,11] Therefore, the term "deradicalization" refers to methods and techniques used to undermine and reverse the completed radicalization process within this definition, reducing the risk to society from terrorism. The term "jihad" will not be used unless a specific example of radicalism is cited claiming a political and religious doctrine that advocates armed struggle in the name of a fundamentalist and violent conception of Islam. Furthermore, this religious usage of "jihad" is itself subject to debate and interpretation since, depending on the school of thought, "jihad" refers as much to the idea of inner or spiritual struggle as to the more prosaic idea of "holy war," offensive or defensive, against an adversary opportunely presented as an infidel (*kafir*), a heretic (*zindiq*), or an apostate (*murtad*).[12] More importantly, religious radicalism in human history encompasses more than just "jihad."

The controversial term "human nature" is used to describe ways of feeling, thinking, and acting that humans have "naturally." To use a Spinozist term, it is the "essences" of humankind. Some authors think of human nature as a pernicious fiction, leaving "human culture" on the side.[13] Jean Paul Sartre famously wrote: "there is no human nature, since there is no god to conceive it."[14] Sartre was developing the idea that philosophy can give man total freedom to achieve his own significance. My aim is not to enter the debate between anthropologists, philosophers, psychologists, and biologists on whether "human nature" exists. This book's claim is that Spinoza's philosophy, combined with molecular biology, might be a new way of looking at human nature.

The idea for this book originated decades ago, while reading the works of three famous scientists/philosophers: Albert Einstein (1879–1955), Baruch Spinoza (1632–1677), and Blaise Pascal (1623–1662). These three thinkers had something in common. Each was a child prodigy in Euclidian geometry, and their respective lives were shaped by those marvelous geometric inferences. Euclid's elements of geometry provided an eye-opening transformation to these youngsters, the exciting of the mind leading to revelation. It became a crucial element in their scientific and philosophical works. As adults, each could arguably be described as contrary to radicalism with atypical, yet specific, visions of God and religion.

Euclidian geometry is an amazing concentration of cleverness. It was written around 300 BC, and it arranged geometric propositions and proofs in a logical manner. The first of Euclid's thirteen books was titled *Fundamentals of Plane Geometry Involving Straight Lines*. This specific subject was the focus of the three children's prodigious interest, especially Propositions 32 and 47, which they considered to be the source of the deep mental transformations within their famous brains. Proposition 32 states: "the sum of the three internal angles of the triangle is equal to two right angles." Proposition 47 is well known as the Pythagorean theorem: "In right-angled triangles, the square on the side subtending the right angle is equal to the squares on the sides containing the right angle." We do not know the exact proofs used by these three young geniuses (there is more than one possibility for each), but we know that they did it at a young age, between 6 and 12 years old. We also know that they used a proof in geometric nature (examples are provided in Appendix 1). They could simply "see it." They were able to create the space that could deliver the formula, which, according to historical documents, involved having a strong visual impression of their "augmented reality," revealing a space to think. As in new virtual reality devices, they could create a spatial mental picture, building the proofs of at least one of the two Euclidian propositions. The relatives of the three geniuses at this time were astonished by the rigor and creativity of their representations (such as Einstein on a side of a book, a Pascal drawing on the floor of the house, and multiple small drawings on paper by Spinoza). These moments are described by the three famous scientists/philosophers as exhilarating. It was so stimulating that the experience turned their young minds into a spinning tumult of ideas, eager to share their discoveries with the world. This sort of intellectual passion for demonstration and understanding lasted long into adulthood.

Albert Einstein independently discovered his own original proof of the Pythagorean theorem at the age of 12. It was mentioned by multiple sources as well as in his own correspondence. This kind of geometric exercise awarded him with a remarkable insight. Later, in his scientific career, he claimed that his troubles in mathematics (he did complain of having troubles in math!) came from his lack of possible representation when using algebra or when using probabilistic approaches that seemed mandatory within physics at the time. The word "algebra" is derived from the Arabic word *al-jabr*, used by al-Khwarizmi to describe the operations of "reduction" and "balancing." It is very different from the "visual" geometric rationale that enlarges the space and makes it observable (see the algebra version of the Pythagorean theorem in Appendix 1). This mathematic "reduction" remained a challenge for Einstein. He is not alone in this construct. It is still

a serious problem for mathematicians. Algebraic topology is a branch of mathematics that uses tools from abstract algebra to study topological spaces and bypasses this hurdle. Algebraic geometry investigates those issues, and for his contributions to that subject, Caucher Birkar[15] from the University of Cambridge in England was awarded the Fields Medal in 2018, often referred to as the Nobel prize in mathematics. Dr. Birkar, with his team, was able to represent in geometric space a set of equation solutions and key problems in modern mathematics.

The issue was not inconsequential for Albert Einstein. Not having access to a clear mathematical representation blocked him relatively early as he was elaborating his relativity theory. It was only with the help of the mathematician Marcel Grossman, a non-Euclidian geometry expert on tensor calculus, that Einstein was able to progress in his work on gravity and relativity. Another aspect of Albert Einstein's personality was his opposition to the radicalization of the mind as defined above. All his life he would be concerned by the rise of radical political or religious movements. After a painful moment during the Nazi period in Germany, in 1952 he was invited to be the president of Israel; he declined. Einstein meditated about the best manner to politely refuse the offer. In fact, he was in favor of a bi-national state and was disturbed by the creation of a unique "religious" state. In a letter written in 1954 to Erik Gutkind, he wrote: "… the Jewish people, to whom I gladly belong, and whose thinking I have a deep affinity for, have no different qualities for me than all other people. As far as my experience goes, they are also no better than other human groups."[16] Once more, Einstein evinced a "Euclidian" vision. It can be demonstrated that the proposition "Jewish people are endowed with higher qualities" is wrong. Furthermore, he considered as counterproductive the "radicalization" of the "selected people" that seemed to be a feature of Judaism and that led to the creation of a religious state. The alleged "superiority" of the Aryan race had provided a rationale for the Holocaust.

Another characteristic visible in Einstein's life that he shares with our two other geniuses is a decentered location of human beings in the universe and in the mind. However, Einstein did provide his specific definition of God and of religion. When a journalist asked him if he had faith in God, he answered: "Yes, but in Spinoza's God." He meant a type of God devoid of anthropomorphic attributes. For him, religion was created by human beings, which renders it unable to provide a law or a moral frame of reference. After fleeing Nazi Germany in 1933 to settle in Princeton, Einstein remained vocal about religion and expressed his opposition to American racism. The effect of religion on racist radicalization was visible in the USA at that time.

Einstein actively defended a deradicalization that opposed both religion and racism. Quite often, he publicly fought against xenophobia. He befriended African American actor Paul Robeson; here was an unlikely duo who later launched an American crusade attempting to put an end to racial violence and lynching. Einstein was a proactive activist. In 1937, when the famous African American singer Marian Anderson was denied access to her room in a Princeton hotel, Albert and his wife invited her to sleep in their home and informed the public about it. From that moment on, every time Marian Anderson's tour passed through Princeton, she would stay with the Einsteins.

In 1946, Einstein challenged American citizens and indeed all human beings by saying: "What can a man of good faith do to combat this deeply rooted prejudice? He must have the courage to lead by example by word and deed." Throughout his life, Einstein set the example by giving lectures in universities reserved for blacks and vehemently condemning racism. He was horrified by the extremism of racist behavior in the United States, a racism arguably much worse than today.

Blaise Pascal was a French mathematician, physicist, inventor, and writer. When he was young, he solved Euclid's Proposition 32, which continued to influence his mind and work. At 16, he wrote a projective geometry treatise, and by age 19 he had constructed a famous mechanical calculator, which was a physical example of the use of arithmetic operations in space. His way of using geometric representation as a vehicle to "think" stayed with him throughout his life. For example, what became known as Pascal's theorem was first stated in his treatise on projective geometry. This states that if a hexagon is inscribed in a circle, then the three intersection points of opposite sides lie on a single line called the "Pascal line." In his book *Of the Geometrical Spirit* (*De l'Esprit geometrique*, written in 1657–1658), he wrote about how geometry has explained the art of discovering unknown truths. Blaise Pascal called this geometric method the "analysis." It was originally written as a preface to a geometry textbook for one of the famous "Little Schools of Port-Royal" (Petites Ecoles de Port-Royal). He was by then 34 years old and no longer just a child analyzing human challenges through geometry. He had become a major contributor to the philosophy of mathematics.

Pascal is known as a genius in France and throughout the world. In documents dated to 1646, he was identified as a member of the religious movement known as Jansenism. The group was opposed to the Catholic hierarchy and was given the group name of "Jansenism" by the Jesuits, who

identified them as having Calvinist affinities. In 1653, Pope Innocent X issued the "*Cum occasione*," an apostolic constitution in the form of a papal bull, which condemned five propositions said to have been found in Cornelius Jansen's *Augustinus* as heretical. Among these five propositions is the concept of the relationship between human free will and "efficacious grace." In his famous book *Thoughts* (*Pensées*), unfinished when he died at the age of 39, Pascal was developing the concept of the "bet." Humans must gamble with their lives on God's existence. God either exists or does not. Like Albert Einstein, Blaise Pascal does not localize the human at the center of the universe (Pensée number 72: Man's Disproportion[17]). Pascal's bet became a trademark of his philosophy. Although it is debatable, the stance was considered by many Catholics to be a definition of tolerance and the opposite of radicalism. For this reason, he was the most popular enemy of the Jesuit members, who considered him a dangerous philosopher and theologist to the Catholic religion in the 17th century, where humans with God were considered to be the center of the universe.

Baruch (Baruch in Hebrew, Bento in Portuguese, and Benedictus in Latin—all mean "blessed") Spinoza, my third example, was so impressed by Euclid's Proposition 32 (see Appendix 1 for an example of his possible proof) that he referenced the methodology all his life. It was the main way he expressed himself, with many examples of his geometrical drawings scattered throughout his letters and books. His book *Ethics* also followed the exact structure of Euclid's methodology.[18,19] Research done on his life and philosophical contributions showed how this geometric eye-opener dramatically changed his vision of the world.[20] This resulted in a key rupture between Baruch and his family, friends, teachers, and the Jewish community over his preliminary de-centering of God and humans. He began regularly expressing the deleterious effects of religion on radicalization and methodically analyzed those issues as pertaining to Catholicism, Judaism, and Islam within his *Theological–Political Treatise* (referred to by many commentators as the "Tractatus"). Following his many letters and *Ethics*, his definition of God generated an abundant literature of discussion amongst philosophers. As Spinoza is central in this book, those ideas as pertaining to radicalism will be further developed in Section 1.

Einstein, Pascal, and Spinoza each formulated their own specific definitions of God. There are still active debates on the three prodigies regarding the atheism conviction behind a particular vision. Googling "Albert Einstein atheist" resulted in 2,690,000 hits and "Albert Einstein belief in God" resulted in 9,100,000 hits (December 2021). For comparison, Max Planck, a well-known colleague of Einstein's, got 243,000 and 426,000 hits,

respectively, for the same search on his name. The definition of God for Spinoza and Einstein is similar in many respects and is quite disturbing for anyone with a religious faith. For Spinoza, God is no more than "Natura." However, nothing is really "visible" by humans. Humans are not different than nature, just a part of the unique substance. The God of Spinoza is an empty concept compared to the usual meaning of God to philosophers and theologians and is well defined in many places including in the *Ethics*. Nature is so exactly the definition of God, without finalism, that Spinoza (and Einstein) considers the question of the existence of God to be nonsense. It would be the same question as: "Does nature exist?" Like Spinoza, Albert Einstein was answering this question with a clear yes. He believed that nature does exist, and therefore so does God in this restricted definition. Yet Einstein (and Spinoza in his letters) argued vigorously that he was not an atheist. He was, however, rather rude about religion. In a famous letter to the philosopher Erik Gutkind, dated January 1954 in Princeton, Einstein wrote[16]: "I would never have gotten myself to engage intensively with your book because it is written in a language inaccessible to me. The word God is for me nothing more than the expression and product of human weaknesses, the Bible a collection of honorable, but still primitive, legends which are nevertheless pretty childish." This same kind of debate exists for Blaise Pascal and his possible hidden atheism. The reading of the *Pensées* does not lead obviously to this conclusion. To the contrary, his work showed the way to separate the definition of God from the human cultural translation into a defining religion. It was not an example of atheism or theism. Experts are still debating Spinoza's views on this issue. Some commentators are convinced that he was using God instead of Nature to avoid the troubles that were frequent for atheists in the 17th century (he was attacked by an "extremist" and kept the coat he was wearing all of his life with the trace of the stab wound as a reminder). Other commentators defend the "atheism" of Spinoza. In *Ethics*,[21] he defined God as: "a being absolutely infinite, that is, a substance consisting in infinite attributes, of which each express eternal and infinite essentiality"; the substance of God having the status of an "absolutely infinite" property.

On reading the first section of the *Ethics*, however, the reader quickly understands that it is not the transcendence of God, or the God of Abraham, Isaac, and Jacob, nor is it the one incarnated in Jesus Christ that Pascal opposed to the God of philosophers. During his life, Spinoza was regularly accused of atheism. He vehemently protested, reverting the accusation against those who conceived of God in an anthropomorphic and irrational way. "*Deus seu Natura*" or "*Deus sive Natura*" can be translated as "God, meaning Nature" (*Ethics*, Part 4 preface), which is one of the more famous

quotes by Spinoza. This terminology is often recalled in his work and gave the strong impression that "Natura" and "God" are interchangeable.

I have given three examples where the God concept in relation to Euclidean geometry led to a potential path towards deradicalization. The extraordinary emotional resonance of wrestling with Euclid's geometric theories at a young age later led to the very efficient political and religious "deradicalization" of their minds. The three examples center on two predominant monotheist religious cultures in Europe (Judaism and Catholicism, though Islam was also discussed by Spinoza) with the specific vision of the place of human beings as well as "God" in the universe. It was the result of the "pacification" of the mind coming from the stimulating intellectual pleasures and rewards of geometric proofs. In *Civilization and its Discontents*,[22] Sigmund Freud referred to escaping at a young age from the neurotic process being a source of possible balance. He considered the negative effects of religion in adulthood to result in a suppression of intelligence. However, could an intense intellectual experience at a young age create a specific neurotic balance that would make radicalization difficult? Why were those three geniuses unable to be cowed by religion after their geometric discoveries as children? These questions formed the beginning of my research for this book. The COVID-19 pandemic triggered radicalism as expressed by violence against science and to various human groups. The human being was no longer the center of the universe. COVID was the center, and billions of people were considered marginal.

The initial question was, is there something to learn from the stories of these three geniuses? Was the straightforward answer that geometric learning is a specific path to deradicalization? This leads to further questions. Humans are bestowed with reason. So how do we explain the opposite example of the large number of political and religious radicalization cases in human history, including during the COVID-19 pandemic period? Is radicalism part of human nature? Western philosophy would argue that humans are set apart from animals because of the "reason" embedded in human consciousness. It should be the source of our knowledge and wisdom. The next question, then, is, if reason is that consistent and reliable, how do we produce so much painstakingly reasoned radicalization? This is the paradox that this work will investigate. This book is not the first to attempt to interrogate this question, as cognitive science researchers have also tried to solve this enigma.[23] These questions are too important to ignore. The design of this composition is focused on one word: deradicalization. While perhaps less ambitious than cognitive research, if achievable, understanding the root causes of radicalism is a must.

My journey began with the reading of *Ethics* by Baruch Spinoza. I was a Spinozist without knowing it. It was through the Gilles Deleuze publications that I discovered the way I felt, perceived, and experimented in the world was akin to Spinoza. Beginning with Spinoza's *Ethics*, a challenging task emerged: understanding its philosophy. Based on Deleuze's reviews, I was expecting much easier reading. Like many other critics, I was disillusioned very quickly. I was reading the *Ethics* with the hope of discovering the core of this Spinozism, with which I believed I sympathized, without actually knowing it. Immediately, I began searching out comments, explanations, and other introductions on this major book by other reviewers. It was necessary to read Spinoza's books more than once. After each reading, I was left with more questions, not less. Some books, like *Spinoza, Practical Philosophy* and *Spinoza et le probleme de l'expression* (I would translate to "*Spinoza and the Challenge of Expression*"), both by Gilles Deleuze,[24] were essential. Many decades after beginning, I still go back on a regular basis to *Ethics*' propositions and demonstrations. I discover again and again new aspects that were not previously perceptible. Newer interpretations from younger philosophers, such as, in 2017, *Le clan Spinoza* by Maxime Rovere[20] or *Le Miracle Spinoza* by Frederic Lenoir[25] provided additional insights. This experience led me to include a Spinoza section. My intention is to make Spinoza's philosophy more accessible to the reader.

I am a physician specializing in clinical research and a scientist who has been reading Spinoza for more than three decades. I am not a philosopher. At best, I am an enlightened amateur cumulating years of efforts as a Spinoza interpreter. My professional experience and expertise are within the fields of medicine, molecular biology, and clinical research. I cumulated knowledge on new data for diseases simultaneously with more and more understanding of the Spinozist "philosophy." I use the quotation marks because, in my experience of reading the *Ethics*, Spinozism became more a way to live than a philosophy. The verb "live" is used in the double meaning of biologically alive and psychologically/ethically the ways to live. This book is not a critical review of Spinoza's work, nor is it a philosophical review within the history of the philosophy. However, the review of the molecular biology and medicine sciences is oriented in the light of the main concepts elaborated by Spinoza. The integration between the Spinozism philosophy and the biology/medical sciences is a complex narrative. It was not the result of the unilateral application of one of the fields concerned to the other but was proceeded by a perpetual back and forth between biology/medicine and *Ethics*, preserving their specific nature.

As I was progressing through this integration, the consequences of how we live in a modern society became important to note. Modern cities are gigantic, and religion remains a major cultural reference. Still, this situation is quite different from the 17th century. In fact, many of my references are older, situated in the Ancient Greek concept of "*polis*." *Polis* literally means city. It can also refer to a body of citizens. It is a term that is used to describe a tightly united, small community of Ancient Greek citizens who agreed on certain rules and customs. It was the location where Spinoza's concepts were able to land on the ground of societal organization.

The Republic, written by Plato around 380 BC, was the source of my first introduction to the potential positive concept of *polis* through the Socratic dialog concerning justice and order in the city. Plato's work was the first to influence my vision of radicalism. Socrates debates with various Athenians about the meaning of justice and whether the just man is happier than the unjust man. This was the key debate. This concept emerges through the consideration of a series of different hypothetical cities in comparison, culminating in Kallipolis, a hypothetical city-state ruled by a philosopher-king. When the terrorist events of 9/11 killed thousands of people in New York, my world view was already shaped by Spinozism. One of the main drivers of Spinoza's philosophy, "do not detest but try to understand," generated many assumptions and helped me find ways to live with the event. This premise led to the reading of another major book from Spinoza, the *Tractatus*. Then came the time of the awful series of attacks in France that re-activated this line of thinking. It was the beginning of this particular type of complete integration of molecular biology, Spinozism, and radicalization, and the real beginning of this work. The "final touch" was the pandemic of SARS-CoV-2 and the forced reckoning of humans within nature.

This book is structured in five independent sections offering to the reader, based on his or her expertise and interests, a reading "a la carte." The sections can be read in any order. Sections 1 (Spinoza's philosophy) and 2 (molecular biology and clinical research) are detailed enough for any nonexpert to understand the exact references of any subsection. However, specific specialists of any one section can decide to get the exact data, for instance, from Spinoza's work or from publications in molecular biology and medicine that are referenced. The sections are designed for nonexperts to pick through the book as interested, even if some discussions would merit a more in-depth reading.

Section 1 covers Spinoza's philosophy. Specifically, the section reviews the concepts of human nature/ontology in relation to the "external" and "internal"

world used unconventionally in Spinoza's work. The publications used are mostly *Ethics* as well as the *Theological-Political Treatise*. His correspondence is also referenced due to the clarifications and additional complexity of ideas expressed in those letters. Specific sections are summarized to help explain the relevance in regard to molecular biology and human nature that will be developed for the concept of radicalism. Some examples include the relationships between the living organism and the nonliving material, or between the body and the spirit/soul being among the main points of interest.

Once again, I am not a philosopher, nor am I an expert on Baruch Spinoza. Though this section covers a large sample of Spinoza's works, it is not an exhaustive review by any means. I recommend reading his entire works, even if it might be a difficult undertaking (particularly the *Ethics*). The rewards of this intellectual undertaking are tremendous, but the effort is also immense. Many readers, specialized in philosophy or not (an example of the latter being Henri Atlan's recent book[26]), apparently went through the same challenges and mentioned the amazing benefits gained at the end of their reading journey. The first section of this book is limited in scope to the purpose of this current work. Given my deep admiration, it feels improper for me to summarize such a thinker, creating an unavoidable bias. An extensive review of his works deserves critical thinking. Still, I am not presenting a superficial review or a genuine reduction of Spinoza's work. I am aiming to get at the core engine and the central element of human nature, according to Spinoza, the part that is building the "joy of understanding" as the goal. It is about "Of the Power of the Intellect, or on Human Freedom," as it is stated in Part 5's title in the *Ethics* ("Potentia Intellectus, Seu de Liberate Humana" in his original Latin).

Section 2 of this book is dedicated to the extraordinary advances in molecular biology and medicine during the second half of the 20th century up through the second decade of the 21st century. The intent is to show how various medical topics align with Spinozist concepts. The revolutionary ability to understand the body and its diseases at the molecular level exploded during the 1970s. This better enabled "evidence-based medicine," where more decisions in medical practice were based on scientific studies. For many experts, evidence-based medicine contributed to improvements of life expectancy in developed countries, an example of such being the results published by the Organization for Economic Cooperation and Development (OECD).[27] At the same time, many more medical specialties began following what is called, "precision medicine." Thanks to scientific breakthroughs, physicians can find exciting possibilities. For example, in

cancer, therapies can be based on engineered viruses and immune cells developed in the laboratory. These types of developments in medicine and molecular biology exemplify the integration of the Spinozist vision of nature. Through looking at the foundations of Spinoza's work and the advances during the last fifty years of the application of molecular biology in medicine, four major topics were selected: (1) genetics, including gene/cell-based therapy, epigenetics, telomeres, and stem cells in human diseases; (2) the neurosciences and their environment, mostly relating to the two neurologic systems and neuroplasticity; (3) body and mind, and immunology; and (4) the human microbiome. These four domains so well represent the Spinozist nature order that they deserve special attention. Many other areas could have been added, such as degenerative, cardiovascular, or infectious diseases, but the selection of chapter subjects was driven by their central position in contemporary medicine.

The field of molecular biology went through two major revolutions during the last fifty years: genetics and epigenetics. New paradigms were created from the understanding of the evolutionary concepts of genetic and therapeutic advances in medicine. Let us look at an example of how a new concept emerged from seeing the evolution of the species interpreted through genetic evolution and the advances in our understanding of molecular biology in human disease.

For millions of years, evolution favored humans who craved energy-rich foods, such as carbohydrates (e.g., sugars), which used to be rare, to be stored as fat. Rarely, if at all, did any of our distant ancestors become diabetic due to being physically inactive combined with having a diet too rich in calories. Why were our ancestors not selected to adapt to the causes of modern diseases? The answer could be that many of the body's features were adaptive to their environments and did not have the time and selective pressure to change faster. This concept is known as the mismatch hypothesis, stemming from the new field of evolutionary medicine.[28] Akin to how viruses work, human selection maximizes lifetime reproductive success and not specifically for health or longevity. Diseases are influenced by the developmental background of people in the context of their current environment.

Like other chapters, these subjects could be a book by itself, and, indeed, already exist. However, as stated above, I have selected the major themes that are within the scope of this book, whose objective is to integrate molecular biology and Spinozism. A list of references is provided to allow the reader to go deeper. A few short examples of genetic, cancer, bacteria,

virus, telomere, epigenetic, neurology, and microbiome applications are superficially examined in this introduction. The hope is to incite the reader's curiosity for Section 2 and its four chapters.

First is the genetic. Human genetics refers to the genes in chromosomes and their role and function in human diseases. Another important component is genomics, defined by the entire genetic information called the genome, and their interactions with environmental or nongenetic factors, such as personal lifestyle. Since the Human Genome Project was initiated in the mid-1980s and completed in 2001, with three billion base pairs (a thousand-fold more than a bacterium such as *Escherichia coli*, and a hundred-thousand-fold more than the SARS-CoV-2 virus), its value has proven immeasurable for the understanding and treatment of many human diseases. Unfortunately, even based on that new knowledge, the initial productivity for new medications had been rather disappointing. Nevertheless, after a few decades, these discoveries finally led to many therapeutic solutions for important medical needs. Working from these findings, the treatment of genetic diseases per se was improved dramatically but represents a relatively small portion of the advances in molecular biology.

We will now look at the case of cystic fibrosis, a common genetic, life-threatening disease (with approximately 80,000 cases worldwide). It is caused by genetic mutations leading to a deficient or defective cystic fibrosis transmembrane conductance regulator (CFTR). This channel on the membrane of the cell is a key contributor to the regulation of the absorption and secretion of salt and water in various tissues, including the lungs. The gene for cystic fibrosis was discovered in 1989.[29] Soon after, our understanding of the diversity of the mutations progressed significantly. In 2016, twenty-five of the most common mutations were listed.[30] Gene therapy had been explored as a potential cure, with limited success. Meanwhile, new oral drugs called CFTR modulators were being tested as potential treatments. By 2018, triple CFTR modulator therapy for cystic fibrosis was producing spectacular results.[31] In 1959, the median survival age of cystic fibrosis patients was six months. By 2010, the prognosis had improved dramatically to an estimate of 37 years for women and 40 years for men. In the United States, those born with cystic fibrosis in 2016 have a life expectancy of 47.7 years. Patients between the ages of 50 and 70 are more frequently observed. However, this success in the quality and lengthening of life was not due to gene therapy. It was not a direct approach to the abnormal gene that succeeded, but the understanding of the abnormal gene to the level of its molecular biologic mechanism and the resultant new drugs. In Spinoza's

terminology, the second kind of knowledge of human composition and decomposition was the appropriate and efficient way.

There have been many improvements in gene therapy, which entails fixing abnormal genes or addressing the lack of gene(s) responsible for a disease. Many developments are evolving from our better understanding of the human genome and how to manipulate it. Much progress has been made on gene/cell-based therapies, such as emerging immunotherapy treatments for hematological cancers. The chimeric antigen receptor (CAR) on T cells (specific white cells in the blood) is now used in clinical practice.[32] It is a genetically engineered technique used on specific white cells in a patient's blood in order to have the capacity to eradicate tumor cells while promoting host immunity to prevent tumor relapse. It is a cell-transfer-based therapy that bypasses the need for active immunization via vaccine, a type of fast learning process for the immune system. This strategy is a mimicry of the regular natural process of interactions between humans and the environment. However, it is a "personal" customization to the specific "essence" of the patient.

Genetically engineered T cells constitute a powerful new class of therapeutic agents that offer hope for curative responses in cancer patients. CAR-T cells have been approved by health authorities such as the US Food and Drug Administration (FDA). What once seemed like science fiction is now an amazing therapeutic tool against cancer. The results of its use on specific leukemia and lymphoma tumors are more than encouraging. The CAR-T therapy called CD19 CAR therapy is the most successful and most advanced. However, the combination of genetic engineering and the capabilities of synthetic products offer a wide range of possibilities to design T cells with enhanced functions. This technique is considered to have the potential to transform more than just therapies for cancer. Indeed, other diseases, such as autoimmune disorders, infection, inflammation, and degeneration, will likely be treated. CAR-T therapy is now being studied worldwide. In July 2018, more than 250 studies were listed in the repository system used in clinical research, called ClinicalTrials.gov, and the number more than doubled the following year. This concept will be further developed in Section 2.

The human genetic process is not the only one that helps physicians. The genomes of numerous organisms related to many disease agents (such as bacteria and viruses) have been sequenced and allowed for the development of solutions for the treatment and prevention of some of the most difficult infectious diseases. Among many possible bacteria examples, the recent

example of meningitides called “B” and the identification of the genome of the Neisseria meningitides serogroup B allowed researchers to develop a vaccine.[33] Meningitis B is a very dangerous and rapidly developing disease, killing babies and teenagers and leaving heavy physical handicaps for survivors. Because of the fast evolution of the disease, no treatment is efficient. Therefore, the only meaningful treatment option is the prevention of the disease through vaccination. The “traditional” vaccines are quite efficient for other meningitis serogroups (such as A, C, W, and Y, used widely around the world). These typical and broadly used vaccines were created from “pieces” of the Neisseria meningitides bacteria combined with proteins called conjugate proteins. Neisseria Meningitides B, however, presents a specific challenge. The infectious agent is able to tag itself using a human protein involved in the immune system (call “complement” because it is a molecular supplement helping the antibody) and escape the protection from the human immune system that is efficient for the other serogroups. Thus, the immunogenicity of the “traditional” B vaccine is too weak to ensure protection. However, through the full characterization of the genome, researchers were able to create and manufacture recombinant proteins that are expressed during the infection, to promote immunogenicity and protection when Neisseria Meningitides B invades a human being aggressively. For this reason, this strategy was called retro-development. Although the vaccines are not 100% effective,[34] experts believe that many outbreaks around the world (one at Princeton University in 2013) were stopped due to our knowledge of the genome of Neisseria Meningitides B. Again, it was the understanding of the interactions between these bacteria and humans that led to the solution.

Switching to virology, another recent example was the genomic analysis of the Lassa virus.[35] In 2018, there was an unusual increase in Lassa fever cases. The study of 220 Lassa virus genomes from infected patients showed that the increase in cases was not due to a particular Lassa virus strain or sustained by human-to-human transmission. The findings were consistent with ongoing cross-species transmission, likely from local rodent populations. Phylogenetic analysis—that is, the evidence of the tree diagram showing the evolutionary relationships, revealed extensive viral diversity that was structured according to geography, with major rivers appearing to act as barriers to migration of the rodent reservoir. This understanding was a key element for the prevention (no vaccine is available for this disease) and the protection of the population from this difficult hemorrhagic fever disease in Africa. The answer was found in the interaction between the virus and its environment.