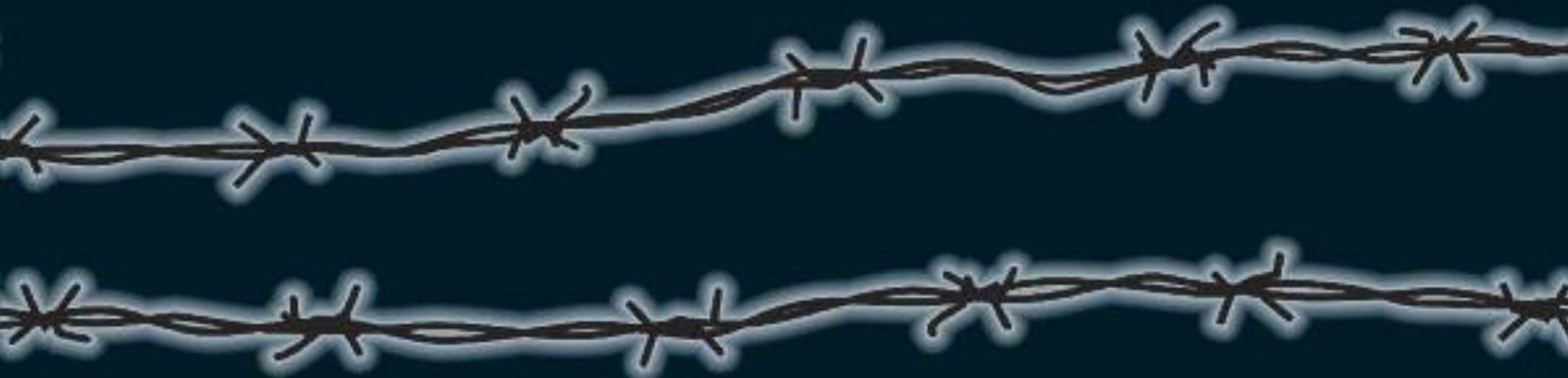


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Ethnicity Religion
Gender Race
Sexual Orientation
Age
Multiculturalism



Thermodynamics, Newtonian Motion, and the Prison:

The Effects of Energy, Entropy and Mass on Rehabilitation

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Recently, I authored a paper entitled *Sub-atomic particles and prisoners: A novel examination of socio-physics and penology*¹ that used physics to obtain insight into offender behavior. That endeavor required that I became familiar with the works of many prominent physicists. As I became familiar with their contributions, I grew keenly aware that commonalities exist between all academic fields. I came to regard the lines that have traditionally separated the scientific disciplines as being arbitrary partitions that must be crossed if we are to increase our understanding of the social world.

In my earlier paper I compared the prison to an atom's nucleus since each serves as the unifying force through which congregation and interaction occur. The proton, since it is positively charged, was likened to those inmates that have a favorable attitude toward treatment. Conversely, since the electron is negatively charged, it was compared to those inmates that have an unfavorable attitude toward treatment. Furthermore, negatively-oriented inmates were seen as having a detrimental influence on positively-oriented inmates since energy and peer influence were viewed as equivalents and were hypothesized to flow from a negative toward a positive orientation. This was seen as impeding offender reform and perpetuating criminality. To break this cycle, an insulator was proposed to prevent negatively and positively-oriented inmates from interacting. The similarities between the social and physical realms depicted in that paper serve as the basis for the present effort.

To begin, we must recognize that physics is the most fundamental of all disciplines. Physicists have long suggested that connections exist between all fields, asserting that every serious attempt to advance our understanding of the human condition must take physical laws into consideration. There exists a persistent belief that without physics, science (both social and natural) would suffer. In fact, in Checkland's influential book on 'systems' he frequently applies physics to the social

sciences.² Even renowned scholar Stephen Hawking acknowledges that a consideration of the natural sciences ideally allows us to 'predict human behavior' thereby, increasing our understanding of the social realm.³

In the following pages, the *Laws of Thermodynamics* (dealing with energy) and the *Laws of Motion* (which pertain primarily to movement and force) are applied to the study of the prison. I selected these 'mainstays of physics' after informally polling students during the 2011/12 academic year. More specifically, students were asked to provide suggestions about those 'physical laws' that they would like to appear in this paper. I agreed to select the two most frequent responses and surmised that to do so would provide a rigorous test of physics' ability to provide insight into prison operations. In addition to determining if (and to what extent) these *Laws* provide insight into the social realm, my intent herein is to encourage creative and innovative thinking. History proves the importance of using imaginative and inventive means in our search for understanding. In fact, Albert Einstein, perhaps the most noted physicist of all time openly endorsed interdisciplinary study and is credited with stating, '*imagination is more important than knowledge*'. This quote emphasizes the importance for scholars to think in a broad, creative, and intuitive fashion. Perhaps this paper can make a positive contribution to this process by encouraging students to do the same. This ability is of vital importance since the role played by the prison within a democracy is paramount to the recognition, promotion, and protection of citizen rights. Few other institutions more directly reflect a nation's values or have such an impact on public safety as the prison. Therefore, any approach that increases our understanding of its operations should be welcomed.

Before proceeding, it is necessary to define a few terms in order to promote a complete understanding of the material to follow. While these terms were defined in my previous paper, their definitions have continued to evolve, making it necessary to revisit them briefly:

□ *penology*, as used herein, refers to the study of the prison (including its inmates, employees, and social

1. Blakely, C. (2010). Sub-atomic particles and prisoners: A novel examination of socio-physics and penology. *International journal of criminal justice sciences* (vol. 5, iss. 2).
2. Checkland, P. (1993). *Systems thinking, systems practice*. New York, NY: John Wiley and Sons, Inc.
3. Hawking, S. (2002). *Godel and the end of physics*. Public lecture given at Texas A & M University; College Station, TX. (March 8).

impact). While I occasionally use the word *corrections*, I do so in the narrowest of meanings, restricting its use to the institutional setting.

- ❑ *socio-physics* is the study of social phenomena from a physics perspective. Since this approach is relatively new, little scholarship exists. In fact, no other application (my previously paper notwithstanding) exists where physics is directly applied to penology.
- ❑ *socio-physicists* are scholars that advocate the use of physics to achieve a greater understanding of human and institutional behavior. The overall number of socio-physicists is currently small (as measured by publications) and is largely limited to physicists themselves.
- ❑ the terms *interest*, *effort*, *time*, and *resources* are considered to be manifestations and functional equivalents of energy since they are individually and collectively necessary for the achievement of the prison's objectives.

It is also important to understand that I am not a physicist nor do I wish to portray myself as such. Instead, I am a penologist that seeks a greater understanding of the prison. While the comparisons herein rely on observations, definitions, and laws commonly associated with the physical sciences, they are nonetheless progressively applied to the social realm. Finally, while my previous paper used physics to obtain greater insight into inmate behavior, the present effort is primarily undertaken to increase our appreciation of the prison as a social 'system'.

Energy and Entropy

Thermodynamics is the study of energy in the forms of heat, pressure, and movement. The history of thermodynamics can be traced to the mid-seventeenth century and to the efforts of Otto von Guericke, Robert Boyle, and Robert Hook (among others). They observed that energy flows from a state of excitement toward a state of rest. For example, the steam that rises from a cup of hot tea (representing a state of excitement or high energy) into the surrounding air (representing a state of rest or low energy) is easily visible. In this example, the tea loses energy to its environment which is confirmed by the rising steam. In time, the tea's temperature will equal that of the surrounding air. If the cup contains iced tea, the flow of energy will be from the environment into the beverage as is demonstrated by the melting of the ice. In this example, the tea represents a state of low energy whereas the air represents a state of high energy. Given time, the tea will be warmed and its temperature will equal that of

the surrounding air. Both examples depict a transfer of energy between objects and environments, with energy continually seeking a lower level. The amount of energy that is associated with (or available to) an object or system often varies and tends to decrease over time.

Physicists interested in thermodynamics pay particularly attention to energy and how its movement and transfer affect system performance. A *system* is a set of components that collectively form an integrated whole. Each component has a functional as well as a structural relationship to the others, with all components working toward a common objective. A system is considered *open* when exchanges of energy occur between itself and its environment and *closed* when no exchanges occur. Furthermore, a state of *entropy* is said to afflict a system when it no longer functions properly or performs at an optimal level. A consideration of energy and its movement within and between objects and systems has routinely been used to explain the dynamics associated with social interaction.⁴

In physics, Isaac Newton is considered a scientific luminary and will forever be associated with the *Laws of Motion*. Newton realized that the direction and momentum of an object remains unchanged unless acted upon by forces that include gravity and friction. Likewise, an object at rest tends to stay at rest, resisting movement. And, similar to the laws of thermodynamics which acknowledge the influence that energy has on the behaviors of objects and systems, Newton recognized that increases or decreases to an object's mass will likely produce a corresponding change in its behavior. He memorialized his ideas within *Mathematical Principles of Natural Philosophy* in 1687 (commonly referred to as the *Principia*). Collectively, the laws of thermodynamics and motion suggest that:

- ❑ energy always seeks its lowest level,
- ❑ the amount of energy associated with (or available to) an object or system often varies and tends to dissipate over time,
- ❑ a system's level of entropy tends to increase over time,
- ❑ changes in mass and/or energy levels tend to produce changes in the behaviors of objects and systems, and
- ❑ an object or system, at rest or in motion, will remain so unless otherwise acted upon.

To determine if and to what extent these observations apply, we must consider the historical and contemporary nature of the prison. Detectable changes in the prison will provide insight into its use of energy, its level of entropy, and how each may affect its operations and ideological orientation.

4. Barrow, J. (1991). *Theories of everything: The quest for ultimate explanation*. New York, NY: Oxford University Press.

Rehabilitative Momentum

Prison scholars identify the prison's traditional objectives as rehabilitation, retribution, deterrence, and incapacitation. While these objectives have collectively exerted significant influence over the prison's activities, an assessment of rehabilitation, more so than an evaluation of any other objective, promises to provide relevant information about the prison's operational and ideological underpinnings. Since rehabilitation is a proactive pursuit requiring a committed effort by officials and inmates alike, its achievement is more energy and resource-dependent than that of other objectives. Therefore, a consideration of rehabilitative-energy may prove crucial to a greater understanding of the prison.

When considering rehabilitation, it becomes evident that as early as the 16th century, its achievement was viewed as a crime-preventative and a promoter of public health. A colonial interest in rehabilitation is detailed in William Paley's, *Principles of Moral and Political Philosophy* (1785). Paley, an English philosopher and religious leader (1743-1805) wrote extensively on the subjects of free will and repentance. Paley's efforts helped ensure that offender reform held a place of prominence in the fledgling prison system of colonial America. For example, in 1787 a group of colonial leaders met at the home of Benjamin Franklin and endorsed rehabilitation as a correctional pursuit. Then in 1870 at a meeting of the National Prison Association (an organization now known as the American Correctional Association) penologists again affirmed the importance of rehabilitation. This assured rehabilitation a place of prominence in American penology for another one-hundred years.

Rehabilitation's prominence was challenged in the latter half of the 20th century when two large and exceptionally violent riots cast doubt on the prison's ability to facilitate inmate reform. The first of these riots occurred in 1971 at the Attica Correctional Facility located in upstate New York. During this riot, 43 individuals were killed. Media accounts of this event portrayed inmates as brutal, inhumane and unworthy of educational, vocational, or therapeutic provisions. The second riot occurred at the Penitentiary of New Mexico located in Santa Fe (1980) and resulted in the deaths of 33 inmates. Its timing solidified the decade-old movement against rehabilitation that had, by this time, gained considerable

political support. These two high-profile riots helped create a perception that America's prisons were on the brink of anarchy and collapse. In fact, nearly 60 per cent of all twentieth century riots occurred during the 1970's and 1980's, with approximately 40 per cent of them occurring in the 1980's alone.⁵ These riots were effectively used by opponents of treatment to solicit support for their position. Robert Martinson, an outspoken opponent of therapeutic initiatives, co-authored the '*nothing works*' report (1974). In fact, the phrase 'nothing works' became the mantra for those that sought to abolish treatment for inmates. Martinson's position was supported by James Q. Wilson (1975) and David Fogel (1975), each of whom demanded that the prison free itself from rehabilitative ideology.

Correctional Mass

Contemporary scholars often ignore the historical relationship between rehabilitation and imprisonment — instead, they tend to portray the prison as an institution whose sole purpose is and has always been punishment. This portrayal has been actively buttressed by the courts. For example, in *Mistretta v. United States* (1989) the U.S. Supreme Court declared that the federal judiciary was no longer interested in rehabilitation. This declaration

was made at a time when the number of offenders being sentenced to prison had reached epidemic proportions. Consider that over the past thirty years, the size of the inmate population has increased by 500 per cent — making the United States the world's leading user of the prison.⁶ In fact, nearly 1 out of every 100 American adults is now behind bars, an imprisonment rate that is 5 to 8 times higher than that of other nations. Currently, state and federal prisons hold about 1.6 million individuals (compared to 300,000 in 1980) and when jail inmates are included, this number approaches 2.5 million.⁷ These figures suggest that the probability for an American citizen to be imprisoned during his/her lifetime tripled between 1974 and 2001.

Consider further that between 1985 and 2004 state correctional expenditures increased by 200 per cent, yet treatment initiatives were simultaneously reduced and eliminated due to financial-necessity. In fact, one state even considered terminating all of its full time prison-based teachers as a way to reduce its operating budget.

. . . a consideration
of rehabilitative-
energy may prove
crucial to a greater
understanding of
the prison.

5. Montgomery, R. and Crews, G. (1998). *A history of correctional violence: An examination of reported causes of riots and disturbances*. Lanham, MD: American Correctional Association Press.

6. Pew Center on the States (2011). *State of recidivism: The revolving door of America's prisons*.

7. Pew Center on the States (2012). *Time served: The high cost, low return of longer prison terms*.

Currently, America's correctional system (including both institutional and community-based components) cost taxpayers about \$60 billion a year with the states of Connecticut, Washington, and Michigan having a combined correctional budget deficit of \$14.5 billion.⁸

Judicial and legislative actions have done little to reduce costs associated with incarceration. In fact, the judiciary is sentencing more offenders to prison than ever before. In 1980, approximately 50 per cent of those individuals convicted in federal court were sentenced to prison. By 2001, 82 per cent received a similar sentence. Comparable trends have been observed at the state level where nearly 70 per cent of all convicted felons now receive a term of incarceration.⁹ The length of time 'served' has also increased. For example, the typical federal inmate now serves 90 per cent of his/her sentence prior to release.¹⁰ Similarly, from 1990 to 2009, the average term of confinement served by state inmates increased by thirty-six per cent. However, the typical Florida inmate has seen his/her 'length of confinement' increase by 166 per cent over the past 20 years.¹¹ Many states, following the federal example, have also adopted 'truth in sentencing' laws that require inmates to serve a minimum 85 per cent of their sentence prior to release, up from a national average of 44 per cent in 1996.¹²

In spite of judicial and legislative action, offender rehabilitation remains desirable with nearly 90 per cent of all Americans currently supporting treatment for prisoners.¹³ Nonetheless, it remains difficult to locate information on existing programs and their effectiveness as measured by recidivism rates. This is partly due to an uncertainty about how to measure recidivism. Some researchers measure it by re-arrest, others by re-conviction, still others by re-incarceration. This makes it especially difficult to compare results among programs since no standard approach exists. Of the three methods used to measure recidivism, re-arrests proves popular since it provides the broadest test available while remaining free of correctional manipulation. In 1983, approximately 63 per cent of all ex-inmates were re-

arrested within three years of release, increasing to 68 per cent by 1994.¹⁴ Increases in the arrests of former inmates have subsequently led to increases in their confinement. For example, the proportion of former inmates returning to federal prison (within 3 years of release) increased by nearly 7 per cent between 1986 and 1994.¹⁵ Currently, about 70 per cent of all ex-inmate's return to state custody within 3 years of release, up from about 33 per cent in the early nineteen-eighties.¹⁶ In spite of these findings, studies of existing programs consistently show that treatment can reduce recidivism rates by ten to twenty-percent.¹⁷ One California-based program produced a 'return to custody rate' of less than eleven-percent.¹⁸ A recent multiple-state study found that inmate participation in educational programming produced a 9 per cent reduction in re-arrest rates, an 8 per cent reduction in re-conviction rates, and a decrease of 10 per cent in re-incarceration rates during the three years following release.¹⁹

A Return to Physical Laws

Having briefly reviewed the laws of thermodynamics and motion, it now becomes necessary to explain how these laws pertain to penology. These laws suggest that:

- ❑ an aging prison system will gravitate toward a low energy state. In this respect, the prison is similar to other objects/systems and tends to lose energy over time. Rehabilitation, being a proactive pursuit, requires large amounts of sustainable energy. In fact, of all the prison's pursuits, rehabilitation may be the most energy-dependent. A decrease in the prison's energy level is reflected in a reduction/elimination of rehabilitative initiatives.
- ❑ an aging prison system will gravitate toward an entropic state. In this respect, the prison is similar to other systems and tends to become less effective over time. Historically, the effectiveness of the prison was directly related to its ability to break the criminogenic cycle. A change in recidivism rates

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8. Engel, L., Larivee, J. & Luedeman, R. (2009). An examination of four states and their budget efforts. *Corrections today* (December).
 9. Durose, M., Levin, D. and P. Langan (2001). *Felony sentences in state courts, 1998*. U.S. Department of Justice, Bureau of Justice Statistics (NCJ 190103).
 10. Sabol, W., Adams, W., Parthasarathy, B., and Yan Yuan (2000). *Offenders returning to federal prison, 1986-97*. U.S. Department of Justice, Bureau of Justice Statistics (NCJ 182991).
 11. Pew Center on the States (2012). *Time served: The high cost, low return of longer prison terms*.
 12. Durose, M., Levin, D. and P. Langan (2001). *Felony sentences in state courts, 1998*. U.S. Department of Justice, Bureau of Justice Statistics (NCJ 190103).
 13. Warren, R. (2007). *Evidence-based practice to reduce recidivism*. Washington, DC: U.S. Department of Justice, National Institute of Corrections.
 14. Langan, P. & Levin, D. (2002). *Recidivism of prisoners released in 1994*. U.S. Department of Justice, Bureau of Justice Statistics (NCJ 193427).
 15. Sabol, W., Adams, W., Parthasarathy, B., and Yan Yuan (2000). *Offenders returning to federal prison, 1986-97*. U.S. Department of Justice, Bureau of Justice Statistics (NCJ 182991).
 16. Silk, E. (2011). *70% of state's released inmates return to prison*. Stanford University, Peninsula Press.
 17. Warren, R. (2007). *Evidence-based practice to reduce recidivism*. Washington, DC: U.S. Department of Justice, National Institute of Corrections.
 18. Silk, E. (2011). *70% of state's released inmates return to prison*. Stanford University, Peninsula Press.
 19. Steurer, S., Smith, L. & A. Tracy (2001). *Three state recidivism study*. Office of Correctional Education, United States Department of Education.

among former inmates (or an excessively high recidivism rate) provides a gauge by which the prison's effectiveness can be assessed.

- when an object/system gains or loses mass, its behavior is affected. Mass within the prison is equivalent to the size of its inmate population. Recent population increases have contributed to reductions in therapeutic initiatives. Conversely, a future decrease in mass may permit the prison's behaviors to more closely approximate those of its pre-expansion state.
- an object/system at rest or in motion will remain so unless forced to act otherwise, to behave in any other manner requires a significant expenditure of energy — either to accelerate/decelerate the object/system or to alter the essence of its actions. If future treatment initiatives are to gain momentum, a substantial investment of energy will be required.

I must now confess that I was deceptive in my previous assertion that all systems are susceptible to energy-loss and entropy. Generally speaking, only closed systems are at risk for these fates since their ability to draw energy from their surroundings is negligible. Yet, it doesn't appear that the prison is completely a closed system nor does it appear to be exclusively an open system. Instead, it displays traits common to each. Consider, for example, that both prisons and closed systems each operate in an isolated fashion, having limited interaction with their external environments. In fact, prison officials have long operated under the 'hands-off doctrine'. This doctrine, popularized by the U.S. Supreme Court's ruling in *Pervear v. Massachusetts* (1886) and reaffirmed in the *Prison Litigation Reform Act* (1995), shields the actions of prison administrators from external review and intervention, greatly reducing the number of exchanges that occur between the prison and society. Yet, the prison should also be considered an open system since it interacts with the public, even if those interactions are limited and are highly controlled. For example, interactions inevitably occur during furloughs, work-release, school-release, and public-outreach programs (even though the availability of these programs has decreased). Furthermore, 95 per cent of all inmates are eventually paroled or discharged, representing the largest

and most enduring exchange that occurs between the prison and society.²⁰ In essence, the prison exhibits a duality in its nature — it operates under the specter of isolation and limited social interaction, but engages in various practices/programs where exchanges are inevitable. While penal practices may be suffering from energy-loss and entropy, an almost inexplicable immunity appears to have protected the prison's ideological orientation from a similar fate. This immunity is reflected in the continuing support that rehabilitation enjoys among prison staff. This immunity may be partially attributable to the public's continuing support of treatment — suggesting that energy derived from an external source may affect prison operations and ideology differently or that multiple types of energy exist — those that influence the prison's operations (political) and those that influence its philosophy (popular). Nonetheless, there appears to be a disjunction between the prison's practices and its current ideological orientation.

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Conclusion

Massive inmate populations continue to result in a redistribution of resources and a reordering of the prison's operational priorities. This has forced prison practices toward the lower end of the energy-spectrum — yet, support for rehabilitative ideology endures among prison officials and the citizenry. Whether rehabilitative initiatives will reemerge remains unknown. However, a reemergence, were it to gain sufficient momentum, would require a decrease in correctional mass and a substantial investment of energy. Provided a decrease in prison mass could be achieved, current levels of institutional and public support appear capable of supplying the energy requirements necessary to power rehabilitative initiatives.

While social scientists have traditionally been hesitant to utilize the natural sciences to gain insight into human and institutional behavior, contemporary researchers are broadening their approach to obtain a more comprehensive understanding of the social realm. Socio-physics encourages the development of creative, innovative, ideological, and interdisciplinary modes of inquiry and in doing so, promises to help advance our understanding of how energy, entropy, and mass affect the prison.

20. Pew Center on the States (2011). *State of recidivism: The revolving door of America's prisons*.