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Predicting the Psychological Response of the American People to Oil Depletion and Declining Energy Return on Investment (EROI)

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Abstract: Oil has played a crucial role in the United States' continued but increasingly tenuous economic prosperity. The continued availability of cheap, high energy return on investment (EROI) oil, however, is increasingly in doubt. If cheap oil is increasingly constrained, how might that impact the American psychological sense of personal and national well-being? We employ general systems theory and certain key paradigms from psychology and sociology to predict the possible societal response to global peak oil and the declining EROI of whatever oil is produced. Based on these frameworks, the following three defense mechanisms seem likely to be employed by individuals and groups within society if and when confronted with stresses associated with declining oil availability. These are: denial of one's passive helpless state, desire to establish a scapegoat, and arousal of affiliative needs and increased subgrouping. A group's "survival" is a function of its unified sense of direction and the stability of necessary interdependencies and linkages. We suggest that the ability of the U.S. society, taken as a whole, to adapt to the stresses derived from the declining EROI of oil will increase during periods of moderate stress, and then decline after reaching its maximum ability to cope with stress. The integrity of interdependencies and linkages—power, communication, affect, and goals—must be preserved for continued social unity. Americans will need to acknowledge the reality of biophysical constraints if they are to adapt to the coming energy crisis.

1. Introduction

Over the course of modern human history, societies have experienced many periods of economic prosperity followed by decline. According to Tainter [1], Odum [2], and Cleveland *et al.* [3], these economic fluctuations have tended to result, directly or indirectly, from variations in a society's access to cheap and abundant energy. Events within the past few decades appear to be consistent with these patterns. The last four out of five national recessions, which have been punctuated by financial institution collapse and bankruptcy, have coincided with higher oil prices [4].

The oil industry has historically played and continues to play a crucial role in the U.S. economy, transportation, trade, and in the maintenance of affluence, *i.e.*, "the Western way of life". There has been more than a three-fold increase in energy consumption in the U.S. over the past 50 years [5]. U.S. economic well-being, national prosperity and stability is inextricably linked to the production and consumption of energy, especially oil [6]. There is a great deal of evidence that we may be entering a period where energy and energy services are much less available to the US and other OECD (Organization for Economic Co-operation and Development) countries. For decades we as a global society have spent an increasingly greater proportion of our global energy on discovering and extracting lower quality, less accessible energy resources [7]. Growth of global oil production has stagnated since 2004 [8]. Energy return on investment (EROI), the ratio of energy supplied to society divided by the direct and indirect costs of its production and delivery [9], provides one means of estimating the cost of oil, one which allows us to measure or estimate how much net oil is available to the economy and might be available in the future [10,11]. While this presumably provides us with more accurate and specific information on future availability than price alone, it does not address the potential effect of changes in oil availability on societal processes. It appears clear that the impending energy crisis will create technological issues and political problems. What is far less clear is the impact on societal processes and more generally on the psychological well being of citizens.

There are significant differences of opinion amongst various members of the peak oil community as to how individuals and small groups within society are likely to react to the effects of the declining supplies and EROI of oil. Some scientists predict that severe oil scarcity will constrain food production, exacerbate poverty in marginal sub-cultures, limit production and conveyance of essential goods and services, expand rifts among social groups, strain other limited environmental resources, and destabilize the state's authority and ability to govern [12]. Others believe that very high-energy usage by U.S. society is not required either for prosperity or for American psychological well-being [13]. Nevertheless the most likely scenario is that Americans (and others) will not be happy about any reduction in their lifestyle as measured by traditional economic criteria. Many researchers believe that Western societies will probably experience significant social-psychological disruption and even societal disintegration.

Although, sociological and psychological assessments performed in the wake of previous energy crises provide crucial components to our understanding of reductions in energy flow, so far they fail to

provide paradigms for discussing the possibility of an indefinite energy decrease that may influence the essence of Western social life. No one knows for sure what the psychological or sociological ramifications of declining oil availability will be, but it is important to begin evaluating and preparing for the social aspects of what might be a very different future. We write this paper not to provide a dogmatic catalog of probable psychological consequences of these far reaching technological, political and societal issues, but rather to open a dialogue on the issues.

Many of the examples used, and theories stated, in this article are extreme versions of the normal psychological and sociological phenomena that occur routinely in the day-to-day functions of any group or society. This paper discusses a segment of the wide spectrum of psychological and sociological responses to extreme stresses such as those that may accompany an energy crisis of large and continuing magnitude. We propose that the main psychological response to energy-related limitations and constraints will be the production of stress [a psychological term which, as we will develop, is far more complex than the usual use of the term], a feeling that ensues because demands exceed the resources an "individual" is able to mobilize, producing physical and psychological reactions that result in mental [14]. This mental tension will probably produce, to varying degrees, the psychological and sociological reactions described in this article.

Historically, a society able to procure and intelligently utilize abundant resources typically experiences economic prosperity. The opposite is also usually true; a society entrenched in an environment with scarce resources, as a rule, experiences economic paucity [12]. If energy is as important for civilization and our economy as we believe, and if and as traditional liquid fossil fuel energy supplies decrease in quality and quantity while the human population continues to grow, we are forced to ask: "How will individuals and small groups within a population accustomed to an increasing and seemingly unending supply of cheap and abundant oil react when faced with a future of declining oil availability?". Curiously, sociologists and social psychologists have barely entered into this discussion. While limited in their education in, and understanding of, the complex technology of the peak oil and related issues, many sociologists nevertheless are competent to examine the possible social ramifications of stress more generally and the related societal processes. What we wish to do here is to apply this general expertise to the stress conditions that are likely to occur from the extensive changes resulting from depleting and ever lower quality oil reserves. A review of political and social responses to scientific pronouncements of declining oil reserves over the past decades reveals a major disconnect between scientific knowledge of depleting oil assets and societal action. Political leaders, traditional economic analysts [15], and mainstream society have largely ignored or downplayed the implications of diminishing oil reserves. The rather baffling question is: "Why have repeated scientific warnings of declining oil reserves and depletion of domestic as well as foreign sources been generally disregarded?". How are people and society likely to respond to this decline if it continues or accelerates? This is an extremely difficult but potentially important question. We turn to the general psychological literature on the response of humans to stress as a starting place for considering this question. There is substantial literature in the fields of psychology and sociology regarding the responses of people when faced with overwhelming crises resulting from war, pestilence, extended crop failure or resource depletion. We apply this literature to establish an understanding of the probable response of people to stress associated with diminishing oil availability. The objective of this

paper is to examine the possible societal and individual stress that is likely to be perceived by American society resulting from resource depletion associated with the decline of oil.

2. General Systems Theory and Stress

Stress, in the sense the word is used in psychology, occurs when there is a union between a stressor (the cause of the stress) and the "individual" perceiving the stressor; stress cannot exist without exposure to, and perception of, the stressor. Throughout this paper we refer to "stress" with the understanding that all stress exists only because it is perceived. Hobföll's Conservation of Resources stress model links the production of stress directly to the perceived threat of resource depletion, actual resource depletion, and lack of gain in resources following energy investment [16]. He suggests that people strive to acquire, maintain, and protect resources and that when these resources are threatened, when there is potential or actual loss of these resources, stress is induced. While Hobföll speaks of stress caused by various types of resource depletion and references 'people' as his level of analysis, we believe that his thinking is applicable to societal as well as individual stress. We suggest that the American public, as a whole, will experience stress as an outcome of perceived and real resource depletion associated with the decline of oil. These possible psychological and social reactions will not be limited to the individual and small group level but will be exhibited on the societal level.

Boulding's general systems theory suggests that observations and analyses of behavior and actions of "individuals" (the term Boulding uses to describe the unit of analysis) at lower levels may be used to understand and suggest possible behaviors and actions of "individuals" at higher levels. In other words, societies are composed of small groups, small groups are composed of individuals, individuals are composed of organs, organs are composed of cells, *etc.* [17,18]. While acknowledging differences associated with scale, we believe that an assessment of societal response to oil depletion using research and theory designed for smaller scale analysis may provide insight into patterns of social behavior. According to Boulding, although the definition of the "individual" (unit) may vary greatly, every scientific discipline studies some sort of "individual" and each of these "individuals" exhibit "behavior", action or change that is related in some way to the environment of which that "individual" is a part [17]. This model, based on the premise of similar typologies among working components at various vertical levels within a society, establishes the theory of scale-free dynamics within social systems. This results in social networks that surpass the specifics of a distinct system and are inherently tied to, and reflective of, the action taken by "individuals" occupying similar roles at higher and lower levels within a network. Boulding further suggests that when the individual is a human being, it is not only the person but also the roles of those persons that create the next level, the social system of which they are a part [17,18]. The connectedness between these levels facilitates analysis of behavior, actions and changes at multiple levels. In other words, observations/analyses of behavior occurring at one level can be employed to provide a better understanding of behavior occurring at adjacent levels. We believe that examining relevant individual psychological and small group sociological research, which explores individual and group reactions to experiences perceived as stressful, provides a starting point to facilitate an analysis of possible small group and societal reactions to depleting oil resources.

3. General Human Response to Stress

Irving Janis in his 1958 book, *Psychological Stress*, developed a paradigm of general human reaction applicable to various severe stressors. Janis' research on general patterns of human response to new stressors concludes that human adjustment and response to threatening or stressful situations varies with the amount of perceived threat. These responses occur as a series of phases independent of the specifics of the stress analyzed. The more immediate an anticipated threat of danger, the greater the motivation to diminish anxiety by minimizing one's perception of potential danger or by denying the gravity of the situation [19]. These expressions of denial tend to be manifested by over-optimistic expectations that:

(1) Minimize their perception of the probability or magnitude of the potential danger,
(2) Maximize the person's perception of their ability to cope with the danger, or
(3) Maximize the person's perception of their chances of receiving adequate help or gratification from the potentially dangerous situation [19].

New stimuli tend to be perceived and interpreted within the context of the known and familiar and viewed as non-threatening until such interpretations are no longer sustainable. When assessing future danger, there is a tendency to extrapolate past trends linearly and draw upon previous experiences to define present circumstances [20]. Fear reactions are not extinguished; they are merely subdued temporarily until the threat is past or clear evidence of danger is brought into the narrowed focus of attention. Once aware of the reality and magnitude of a significant genuine threat, individuals are forced to reconsider their optimistic assumptions, and they tend to feel and display the fear that they had temporarily managed to inhibit [19]. As long as Americans do not perceive the direct and tangible effect of declining EROI of oil, they can and will likely continue to exhibit minimal response.

Here the question of the pathology of denial arises. At what point shall denial be deemed pathological? Experts in a myriad of fields including ecology, engineering, and economics have been ringing oil resource depletion warning bells since the 1970s American Oil Crisis [21]. To many, the 1973 Arab Oil Embargo served as an indicator of the impact of future global peak oil, and members of the scientific community have been cautioning the world ever since [22]. In the face of seemingly unquestionable evidence to the contrary, why have some "individuals" within U.S. society continued to deny the impending energy crisis?

Denial is deemed pathological if there is an unwavering rejection of a highly undesirable fact about a present situation in the face of evidence that is clearly perceived and generally regarded by others as "unquestionable" [19]. The resulting impaired judgment appears to be the handiwork of conscious suppression coupled with unconscious repression colluding to create and maintain a "pseudo-optimistic" attitude [19]. Although it appears, at this writing, that the majority of Americans have never heard of the term "peak oil" and few are knowledgeable about timelines for possible oil depletion, most have some awareness of the previous (1970s) oil crisis and the possibility of repeating that scenario. We ask, "What will happen when reality sets in, when the world's oil production peak is finally conclusively verified and we start the slide back down the energy curve? Will we futilely attempt to hold fast to our comforting delusions"?

4. Defense Mechanisms Associated with Perceived Stress

According to Janis, once the reality of a crisis situation has filtered through, a variety of potential defensive reactions spring to life. Three of these defense mechanisms seem most likely to accompany the perceived stress associated with a possible oil crisis:

(1) Denial of one's passive, submissive state,

(2) Use of "scapegoat" mechanisms, and

(3) Increased affiliative needs and the formation of closely-knit sub-groups.

These defense mechanisms are often accompanied by a temporary gap in memory, with retrospective distortion of pertinent facts surrounding the threatening situation [19]. This process is a manifestation of a conscious turning away from, and an unconscious curtailing of, thought processes involved in comprehending the threatening situation.

4.1. Rejections of the Passive Submissive State

The concepts put forth by Janis are not new in psychology. Anna Freud, Sigmund's daughter, suggested two interrelated, unconscious defense mechanisms related to the rejection of one's passive submissive state: (1) identification with the aggressor, the one in control, the one with the power [23]; and (2) the fantasy that one can inflict the feared damage upon the aggressor, a denial of one's actual passive, helpless state. "Originally described as a defense used by children to cope with overwhelming fears of a powerful parent, this mechanism has also been observed in adults who are under the realistic threat of severe punishment from powerful authority figures…" [19]. In these circumstances, powerless persons react to their passive submissive state by expressing the fantasy that they are the aggressor, in the "all-powerful position," and the authority figure is passively helpless [23]. We utilize general systems theory to indicate that this shift in perception is applicable to various positions and levels of societies: political and military leaders, politicians and societies as a whole can shift from an initial recognition of impotence to a belief that they possess the necessary power to control or at least influence the desired outcome.

According to the laws of physics, power in the physical realm is defined as the ability to perform work [24]. The ability of developed nations to perform work: to manufacture, to industrialize, to exploit, create, and maintain a strong economy, is intrinsically linked to access to and utilization of petroleum-based energy [25]. Without energy one is unable to perform work and is therefore rendered powerless. Henri Bérenger in 1921 summarized this position, "He who owns the oil will own the world, for he will own the sea by means of heavy oils, the air by means of the ultra-refined oils, and the land by means of the petrol and the illuminating oils. And in addition to these he will rule his fellow men in an economic sense, by reason of the fantastic wealth he will derive from oil—the wonderful substance which is more sought after and more precious than gold itself." [26]

The intrinsic link between access to and control of petroleum and military power [27] was clearly demonstrated during World War II. The Allies crippled the German military by targeting fuel supplies that were imperative to German military operations as well as to their industrial sector. Allied forces won the infamous Battle of the Bulge because the Germans simply "ran out of gas" [26]. Germany, with no oil and moderate amounts of coal, had insufficient energy to sustain Hitler's military machine.

The U.S. military also experienced a taste of the impact of insufficient oil on military action when General Patton found his Third Army forces without the necessary fuel to go into battle in Germany [28]. At this time the U.S. was the major global oil supplier, producing approximately 75% of the petroleum used throughout the world [29]. Ownership of this massive piece of the energy pie greatly facilitated the outcome of this war [26]. At the end of World War II, the United States was a world super power and because it owned the oil, it *did* own the world and *did*, in an economic sense, rule over its fellow men. Today, the Middle East has 58% of the world's proven oil reserve [30]. The U.S. no longer commands the oil genie. Although Americans may continue to feel a sense of economic entitlement, this is possibly an indicator of a collective denial of U.S. economic and perhaps even military vulnerability.

The major global energy holders are the Middle Eastern countries, controlling 57.5% of the world's demonstrated oil reserves [30]. Saudi Arabia, alone, possesses the lion's share, approximately 20%, of global oil reserves [31]. This large and essential energy reserve provides Saudi Arabia and other Middle Eastern oil producing countries with the ability to influence production, trade, and the day-to-day activities of Western culture [31]. The U.S. energy/power position is even more untenable, because it uses some 22% of the world's oil consumption while owning only 1.7% [30] of the world's oil reserves [32]. If oil does translate into political and economic power then nations in possession of abundant and easily accessed oil are truly in positions of power. The power that the U.S. once wielded as a result of controlling the lion's share of the world's oil has shifted. Denial of this shift in energy resource power and refusal to accept the accompanying submissive state has required the implementation of a new national definition of power.

Today, the "American way of life" is dependent upon and is unable (with current technology) to exist without accessing energy, mainly oil, from others [33]. To sustain this way of life, the U.S. must now rely upon military strength, diplomatic relations, and a large but deteriorating economic situation to maintain the energy flow from other nations. The U.S. military expenditures in 2009 exceeded $660 billion (USD), which is 43% of the world's total military budget, an amount greater than the combined expenditures of the other top 15 nations with the highest military expenditures for 2009 [34]. This large military budget provides a strong overseas military presence, one purpose of which is to insure the constant energy flow necessary for the perpetuation of the day-to-day activities and affluence of Western culture.

One measure of power is gross domestic product (GDP), the value of all final goods and services produced within a nation in a given year. U.S. GDP, currently over 14 trillion USD, has been the largest in the world economy since the end of WWII [35]. But here too the production and consumption of the goods and services that comprise the U.S. GDP are fundamentally reliant upon oil supplied from outside the U.S. and increasingly by Middle Eastern countries [36]. The fragile diplomatic relations between the U.S. and Middle Eastern countries, during the post WWII era are fundamentally linked to the maintenance of the world oil trade status quo and U.S. reliance upon a world economic system that requires very large U.S. imports of oil and other basic and also manufactured resources. The Arab Oil Embargo [37], Desert Storm [38], the "9/11" fall of the Twin Towers [36], the Iraq "war" [39] and the War on Terrorism [36] are all direct or indirect manifestations of the U.S. need for foreign oil and the complex responses of both the U.S. and those who supply it [40]. Thus as the U.S. has become increasingly dependent upon imported resources, resource-rich "developing nations" increasingly are

able to impact the destiny of U.S. wealth, prosperity and, perhaps, national security. U.S. economic and military reliance on energy from potentially unfriendly foreign sources [41,42] in conjunction with the jarring reality of U.S. susceptibility to foreign attacks, heightened by the 9/11 terrorist attack [43], has made Americans aware of their vulnerability, to an extent that the U.S. populace has hither to not been exposed. In cases such as these, a sense of impotence can shift to a belief, or fantasy, that the necessary power to control or at least influence the desired outcome may be obtainable if sufficient resources are diverted to this endeavor [23]. The demand by the U.S. to envision itself as in an "all-powerful position" has resulted in an exaggerated global military presence designed to influence oil rich nations' willingness to abide by established Western trade practices favoring U.S. economic prosperity.

In conclusion, we argue that the U.S. military presence in the Middle East was facilitated by a national sense of loss of international power, economic control, and less effective attempt to control the flow of oil. U.S. foreign oil dependence has grown while U.S. production has declined. Thus, the U.S. is, in a sense, replacing its previous world oil prominence with extensive global military prominence.

4.2. Scapegoat Mechanism

Janis' second defense mechanism, scapegoating, appears initially as a latent attitude rather than overt action. According to Janis, scapegoating is the wish, fantasy, or desire that "if somebody has to suffer, let it be him rather than me" [19]. To effectively accomplish this, intolerance, bias, prejudice, and stereotypes are established enabling those impacted to deflect their frustrations to other people through the imposition of discriminatory injustices and, if necessary, death and destruction to be directed toward the "target" without guilt. These de-humanizing processes not only facilitate the establishment of a scapegoat, they justify actions which are then taken against individuals and groups defined as flawed and inadequate [44]. This egocentric concern for one's own well being at the expense of others yields a narcissistic disconnect from traditional moral grounding and can be accompanied by guilt and depression, and even fears of retribution, that "next time it will be my turn." Once scapegoating has occurred, these emotions and concerns for "payback" and/or revenge may result in excessive docility, apathy, and other depressive symptoms. Use of de-humanizing scapegoating to justify actions taken to bolster one's own situation is particularly likely among persons exposed to extremely stressful situations where escape is believed to be highly improbable or impossible [45].

Traditionally, conflicts between rich and poor, once played out in the streets of industrial cities, had been subdued by an increase in the wealth of the nation as a whole (*i.e.*, "a rising tide lifts all boats"). Throughout the past five decades, however, the Ginni coefficient (a measure of the equitability of the distribution of wealth) steadily increased, indicating greater inequality between rich and poor. During this period American workers were relatively quiescent about this because their paychecks, even when corrected for inflation, tended to increase. That general trend has now ceased; take-home income for U.S. working families actually decreased by eight percent during the 2000 to 2009 period [46]. This cessation of income growth is almost certainly associated directly or indirectly with a reduction in the growth rate of oil production and the net energy from it. As the growth in oil production diminishes (*i.e.*, the sequence to "peak oil") and the EROI of oil and other major fuels continues to decline, it seems fairly likely that the economic pie will continue to contract.

As the EROI of global oil declines, it is likely that larger portions of the "working class" population will become impoverished, fewer manufacturing jobs will be available, and the need for manual labor supporting these manufacturing jobs will continue to decline [21]. The global manufacturing landscape has already experienced these trends. Current movement towards mechanization and automation [47] has resulted from the managerial goal of low labor cost and high labor productivity. One effect has been the displacement of workers from relatively high-paying industrial jobs [48]. Industry has turned to international competition and modern petroleum-based technology to meet its goals of enhanced productivity, with fewer workers required to accomplish the same task, and lower production costs [49]. Increased productivity has traditionally allowed both labor and management to make a greater profit, and this had played a significant role in the great wealth accrued by America throughout the middle of the last century. The ongoing trend towards computerization and robotics throughout the U.S. economy (*i.e.*, everything from retail store self-scanning checkout stations to automated manufacturing plants) and movement from domestic production to international labor markets has resulted in higher labor productivity. The downside is a decreased need for labor within the U.S. economy, especially for the industrial manufacturing jobs that once provided enormous collective wealth for the American working class [50]. As labor opportunities dwindle, there is a tendency to seek scapegoats on whom to blame decreased employment prospects. Recent government campaigns to limit or halt immigration during periods of economic recession and high domestic unemployment [12,51] and periodic campaigns to buy products "made in America" exemplify societal responses to fears of perceived (and real) employment scarcity. Increased apathy and depression manifest during extended periods of increased unemployment and decreased probability of re-employment [52].

The desire to identify and blame the culprits behind the myriad of social and economic problems (related to the issue of decreasing cheap energy) is not limited to issues surrounding imported products and immigration. The American populace and mass media are accustomed to seeking scapegoats from among the leaders of various sectors of society for what they perceive as the inept handling of the multitude of social issues and economic crises facing the country. Failing industry, banking and investment collapse, and government policies and decisions have been subject to government committee investigation, media scrutiny, and become common topics of conversation across the United States [53]. Without regard for the political party currently in power or the decisions currently being made, Americans choose to blame those on Wall Street, the various CEOs and CFOs of industry, the White House, and the politicians on Capital Hill for the current "state of distress" rather than recognizing the increasing reality of the end of growth of oil and cheap energy [54].

4.3. Affiliative Needs and Sub-Grouping

Janis reports a third response to perceived stress: an arousal of affiliative needs (the desire to associate with others that hold or espouse similar ideologies and commonly perceived needs). This group-level defense mechanism is likely to occur during highly stressful moments, especially when the danger of being injured or killed is imminent [19]. This is usually expressed as an unusually high need for companionship and affection among individuals within the group [19] and coincides with a willingness to drop normal psychological barriers. When a large group of people are faced with impending demise or physical damage, these strong affiliative needs tend to result in the formation of

sub-groups of individuals of like minds within the larger group [20]. Factions of strangers may experience a sudden sense of unity when exposed to perceived danger.

For example, the American citizenry's reaction to the terrorist attack on the United States on 11 September 2001 and its aftermath exemplifies this psychological and sociological response. America's momentary abandonment of conventional social barriers (e.g., strangers on the streets of New York City embracing and consoling one another immediately following the Twin Tower collapse) and subsequent societal communion reflect strong affiliative needs during a time of perceived stress. Acts of increased patriotism in the form of increased flag purchases, flag flying, and bumper stickers espousing nationalistic phrases clearly support the presence of this phenomenon. A simple comparison of U.S. flag sales for Wal-Mart Stores, Inc. on 11 September 2000 (6400 flags) and 12 September 2000 (10,000 flags) *versus* those purchased on the day of the attack, 11 September 2001, (116,000 flags) and the following day, 12 September 2001, (250,000 flags) [55] demonstrates an immense and immediate pro-American communal response to the attack and perceived threat of attack [56]. This intense single-minded nationalism eventually shifted to the formation of sub-groups espousing varying levels of anti-Terrorist/pro-American affection as variations in perceptions became apparent [57].

Currently the U.S. retains access to an abundant although expensive supply of oil. Declining oil reserves and production, in both the U.S. and the world, however, will likely lead to a disruption in oil supply and eventual damage to the U.S. social, political, and economic framework [12]. The current popular call for "fiscal responsibility" is an example of societal reactions to this new perceived scarcity. Disruption of the societal framework by interruptions in oil supply, at least in the short-term, is apt to rekindle the intense affiliative needs and subsequent sub-grouping behaviors observed in the aftermath of the 9/11 terrorist attack. It is possible that these affiliative needs and resulting re-kindled like-minded groups espousing a "we *versus* they" mentality may result in the U.S. exercising diplomatic and military measures to secure resources (oil) necessary to ensure the continued "American-Western way of life".

4.4. Net-Effect of Employment of Defense Mechanism

The net effect caused by the employment of these modes of defense is the formation of an illusion of personal invulnerability. Survival of one or more dangerous situations tends to reinforce these feelings [19]. The 1973 Arab Oil Embargo first exposed the precariousness of the US-OPEC oil trade. The resulting severe fuel shortage produced numerous energy saving policies (e.g., reduced speed limits) and technological changes (e.g., installation of residential solar hot water panels and production of smaller automobiles). After oil availability and prices returned to previous levels, energy saving efforts and concerns about oil availability waned. Apprehensions were assuaged, American life returned to normal, and speed limits and the size and power of most American automobiles gradually climbed.

This reaction is not unlike that of WWII British air-raid victims studied by Janis. Air-raid victims reported that although they immediately sought shelter upon hearing the first air-raid sirens, they did not continue to do so for subsequent sirens. Even though initially they were quite certain that they were going to be killed, when the all-clear signal went off without incident, they felt secure that they were in no danger. Having survived a previous strike(s), they continued their routine activity during subsequent

air-raid attacks; they no longer felt threatened and did not seek shelter even though some were killed [45]. This is an extreme example of denial of vulnerability and desensitization, a psychological process where repeated exposure to a fearful circumstance significantly alters the subsequence responses.

Although the threat produced by the 1973 Arab Oil Embargo was not life threatening, as was the London air strikes, it was the first oil shortage, controlled by foreign nations, experienced by U.S. citizens. The U.S. experienced domestic peak oil production in the lower 48 states in the early 1970s [58]. This coincided with the rise of OPEC, the usurpation of Aramco and other subsidiaries of multinational oil companies by Saudi Arabia and other OPEC states, and the quadrupling of the price of oil in 1973–1974 [59]. This brush with peak oil and oil shortage provides a window into the psychological and sociological responses of the American people to the relatively high intensity stresses of declining oil availability. The subsequent reduction in oil availability resulted in short fuel supplies, higher fuel prices, long queues, and consumer supply limits [60]. What followed were severe recessions, inflation [61], and a loss of jobs [62], in other words a very large stress to our society. The acuity of the '73 oil crisis led to an almost ubiquitous realization by the American people of U.S. dependence on oil for the maintenance and support of its economic machine.

While some within the U.S. sought a more aggressive solution to the problem of obtaining oil from foreign sources [63,64], the prevailing opinion within the U.S. populace was that government should take a more passive role in international affairs, be cognizant of its limitations, and focus on domestic problems [65]. Denial of one's passive submissive state does not seem to have played a significant role in the U.S. response to the oil crisis of '73. While the '73 oil crisis did represent a strong stress event in U.S. history, it is important to distinguish this event from our current circumstances as U.S. oil production at that time accounted for almost 80 percent of domestic oil needs [66]. Additionally, the OPEC embargo accounted for only a 4 percent reduction in U.S. oil consumption [66]. Unlike our current energy situation, the U.S. was perceived as a powerful energy producer and was largely immune to the whims of foreign states.

This decrease in oil availability was generally met with strong opposition. According to Belk *et al.*, most American consumers failed to see themselves and the general public as a major cause of the energy crisis [67]. As President Carter indicated, many Americans "deeply resented that the greatest nation on earth was being jerked around by a few desert states". [64] The U.S. populace sought scapegoats in OPEC countries, the governments of large oil-importing nations, oil companies, and portions of the public that were perceived as wasting finite energy resources [67]. The choice of scapegoat depended upon an individual's perception of "personal responsibility" for the energy crisis. Belk *et al.* found that those individuals that ascribed the collective problem of energy shortages to personal causes were more likely to place the locus of blame on the general public and typically preferred conservation solutions. Conversely, individuals that attributed the collective problem of energy shortages to non-personal causes were more likely to blame oil companies and generally favored government actions against these firms [67]. These stark differences in causal attribution further divided the public along ideological lines and increased sub-grouping phenomena [68].

As the decade progressed, the U.S. populace continued to express concerns over the U.S. energy situation. Throughout the 1970s U.S. majorities indicated that, as a nation, the U.S. was investing "too little" in the development of the country's energy resources [69]. The Iranian Revolution, the subsequent 1979 energy crisis, and the events that followed radically influenced U.S. foreign policy.

Strikes, demonstrations, and protests curtailed Iranian oil production and export leading to reduced oil availability and higher gas prices [70]. In addition to issues experienced during the previous energy crisis, the U.S. populace was forced to face its impotence in thwarting the September 1979 election of Fidel Castro as the leader of the Non-Aligned Movement, the November 1979 Iranian hostage crisis, and the December 1979 Soviet invasion of Afghanistan. The American public's skepticism of détente and the intensions of its southerly neighbor were strengthened after intelligence uncovered the existence of a Soviet combat brigade in Cuba [65]. The following month, Castro assumed his role as leader of the Non-Aligned Movement, a position that afforded Cuba, a perceived enemy of the U.S., with influence over OPEC and other critical oil producing nations [71]. To add insult to injury, Castro delivered a statement on April 24, 1980 that permitted the unrestricted exodus of Cuban nationals. In the months that followed almost 125,000 Cubans arrived in southern Florida [72], many of whom were perceived as "social undesirables". Cuba's benefactor, the then USSR, further threatened U.S. foreign oil interests. A Harris poll concluded that a 78 percent majority thought the Soviet invasion of Afghanistan was a strategy to acquire "more influence over the oil-producing countries of the Middle East." [73] As Yankelovich and Kaagan stated, the American people "felt bullied by OPEC, humiliated by the Ayatollah Khomeini, tricked by Castro, out-traded by Japan and out-gunned by the Russians" [65].

The stress from these energy related circumstances increased affiliative needs and unified the American people toward a common purpose. A poll conducted by Yankelovich, Shelly, and White, found an 80 percent majority believed that the Iranian situation had helped to unite the nation [65]. OPEC, the Ayatollah Khomeini, Castro, and the USSR presented the U.S. populace with ready scapegoats on whom blame for the '79 energy crisis could be attributed. The disquieting realities of late 1979 and early 1980 left the American people frustrated, angry, and anxious over America's novel but pervasively submissive role as an international leader. Faced with the perception of a strategically weaker America, loss of prosperity, and a plethora of failed, impeded, or ineffective foreign policy initiatives, the U.S. populace experienced a decided change that historian commonly identify as a watershed event [65]. President Carter's remarks are a testament to America's perceived sense of emergency, "Let our position be absolutely clear: An attempt by any outside force to gain control of the Persian Gulf region will be regarded as an assault on the vital interests of the United States of America, and such an assault will be repelled by any means necessary, including military force" [74]. Carter's inability to act decisively to effect these sentiments in the eyes of the American people ultimately led to the election and ascension of the Reagan administration; a decidedly different leader charged with redefining America's posture of assertiveness [65]. The American people had grown tired of foreign bullies and wished to reject their passive submissive state by adopting a tougher stance in the international arena.

U.S. government dealings with "troublesome" OPEC nations, during the decades that followed, have been persistently bellicose, determined to avert the loss of control experienced in the wake of the 1979 energy crisis [75,76]. Conversely, the American people were far quicker to forget the tumult of the late 1970s and early 1980s [69]. When the embargo ended and oil prices returned to previous levels, life returned to "normal"; the instability and volatility of the oil trade was largely ignored or denied by the American populace. The economic rebound of the late 1980s and 90s left the people of the U.S. with a false sense of invulnerability and in a state of denial regarding the severity of the

energy crisis situation and only a vague, lingering, perception that eventually long-term changes would be required to facilitate continuous acquisition of foreign oil [77].

5. Impact of Intensity and Duration of Exposure to Stressors

According to Torrance, for groups to survive, they must have, at a minimum, a unified sense of direction or path that, if followed, will assure survival and stable patterns of interdependencies and "linkages". Torrance suggests that clarity in both of these areas is essential to group survival [78]. The connections and relationships, or linkages that he refers to are the distribution of power within the group, the establishment and maintenance of communication networks, the emotional bonds among members, and the communal goals of the group; these act as the "glue" that bonds group members to one another. Torrance further proposes that a group's success at maintaining this "glue" is mediated by the variables of duration and intensity of stress. According to Torrance, groups exposed to unabated stress will eventually experience fatigue, the breakdown of essential linkages and finally collapse. He notes that groups may vary dramatically in the length of time required to reach collapse and that the intensity of stress experienced influences this time frame. Before the breaking-point is reached, a variety of positive and negative effects may occur; prior to their demise, groups under stress may initially flourish. The ability to adapt to stressors and flourish is facilitated or thwarted by the effectiveness or ineffectiveness of the previously defined linkages. Torrance's research suggests that bonds among group members will initially increase with increased perceived stress. Increased bonding will occur until an apex is reached where, although perceived stress may continue to increase, a decline in the strength of these bonds will begin to occur causing disorganization and eventual disintegration of the group. Seyle's 1975 differentiation of two types of stress: eustress and distress [79] describes similar reactions to that described by Torrance. When response to a stressor enhances the functioning of the individual, it is considered a positive coping response: eustress. This positive response to stressors continues until some theoretical apex is reached. At this point, according to Torrance, although the intensity of stress may continue to rise, a decline in the strength of integrating bonds is likely to occur, causing disorganization and eventual disintegration [80]. Seyle defines this as distress; when stressors persist, unresolved *via* coping mechanisms and adaptation, distress results. One's experiences, expectations, and resources available for coping with the stressor, as well as the duration of exposure to the stressor, influence the outcome [79].

Figure 1 is our visual conceptualization of Torrance's ideas on the impact of duration and intensity of perceived stress on group integration. The x-axis represents the duration of a group's exposure to stress. The y-axis denotes the intensity or degree of stress to which a group is exposed. A society exposed to moderate degrees of stress for a moderate amount of time has the capacity to exist and perhaps thrive under stressful conditions (area C). Area B of this graph illustrates that persistent, unabated stress negatively impacts a group's ability to perform the necessary integrating maintenance functions that assure survival and stable patterns of interdependencies and linkages. Area A illustrates the impact on a group exposed to sufficiently extreme stressors; the group's ability to perform integrating maintenance functions will suffer. In other words, groups not only experience a breakdown in their integrative functions when exposed to sufficiently intense stress (area A), they also experience a breakdown in these functions if consistently exposed to varying degrees of unabated stress [80],

without regard for the intensity of that stress (area B). The graph suggests that in combination these two facets of perceived stress: intensity of the stressor and duration of exposure to a perceived stress, result in group breakdown and eventual collapse. It suggests that not only can a group's maximum coping capacity be exceeded but also when this is exceeded, the integrative activities that bond segments of the group together no longer adequately function and a breakdown of that group results. Examples of societal breakdown or collapse resulting from exposure to extreme stress over a short period or modest exposure over a prolonged period are rare. This dearth of historical examples may be due to the complex inter-group dynamics between large social states. Societies exposed to modest degrees of stress for long periods may dissolve completely (e.g., the decline of Easter Island [81]) or may be subsumed by another social state (e.g., the fall of Rome to the Germanic Tribes [82]). Societal breakdown resulting from acute traumatic stress usually follows war or natural disasters and may be accompanied by a period of societal decline (e.g., the fall of Athens to Sparta [83]). It is important to note that all societal collapses are complex, multifaceted, and result from a variety of causal factors.

Figure 1. The interaction of two independent variables: intensity of a stressor and the duration of perceived stress- the impact on group integration.
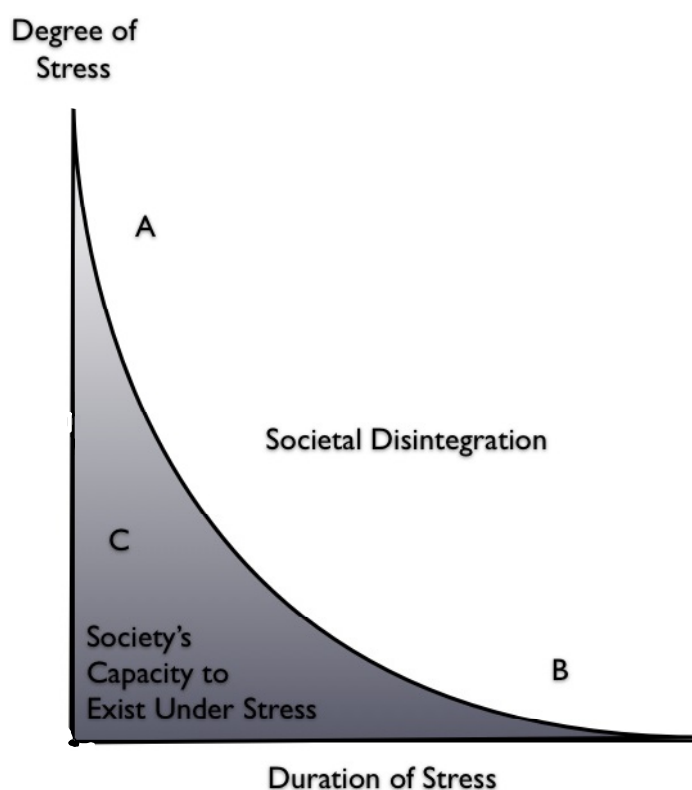
6. Torrance's Model Applied to Future Decline of Oil

Applying general systems theory, we extrapolate societal response to the perceived stress of declining oil availability from general individual and group level responses to stress. We suggest that when groups are conceptualized or envisioned as the collective 'individuals' within a society, Torrance's model of group reaction to intensity and duration of stress can be used to examine societal reactions to stressors that vary in intensity and to which exposure is continuous and unabated. We suggest that Torrance's model can be used to understand the stress introduced to western society

by declining oil. Because oil is a critical non-renewable natural resource, inherently limited and finite, the eventual yet inevitable decline of oil is likely to introduce societal stressors. It will not act as the sole stressor and it may not cause social disintegration or collapse. Rather, it is intrinsically linked with economic, political, and social factors (the underpinnings of an industrial society) that could, if the U.S. persists in a business as usual mentality, unite to produce the breakdown of society [12]. There will undoubtedly be vast differences in the length of time required for various societies, under the stressors associated with the declining EROI of oil, to reach a "breaking-point" or enter a decline in organization and integration. However, if and as this breaking-point is reached, negative effects including confusion, inefficiency, recklessness, apathy, fatigue, hostility, and changes in leadership may be exhibited [80]. We already see some signs of what we perceive as response to declining EROI as the increasing difficulty of governing in the United States at all levels and increasing political hostility of the different political parties.

As we apply Torrance's paradigm to describe possible responses to stressors resulting from declining oil, we recognize that the ability to adapt may be either facilitated or thwarted by the strength of a society's interdependencies and "linkages"; the glue binding that society together [80]. The distribution of power, communication networks, emotional bonds, and communal goals within a society normally act as the "glue" bonding members with one another. They unite to form a network of connections that result in a society's perceived sense of unity and that society's ability to effectively perform integrating maintenance functions [80]. According to Torrance, as stressors increase, the ability to perform increases until there is a maximum linkage efficiency and effectiveness is reached. If exposure to stressors continues unabated, the linkages binding groups together weaken and the forces "tearing apart" the group exceed the forces maintaining it. We suggest that Torrance's model of the impact of stressors on social interaction, when envisaged as a plotline, resembles an inverted U-shaped curve. Figure 2 conceptualizes the effect of varying exposure to stressors on interdependencies and linkages that bond various portions of society to one another.

For the purpose of this study we will call this inverted U-shape the 'Bonding Force Curve'. The Bonding Force Curve applies Torrance's paradigm, describing societal reactions to perceived stress, to an inverted U-shaped curve model of the dynamic relationship between societal bonding forces and perceived stress. The curve's inflection point represents the level of bonding at which a group's performance of integrating maintenance functions becomes de-coupled by increased stress resulting in a decline in a group's bonding forces.

A variety of authors have found similar empirical inverted U-shaped curve phenomenon related to stress and performance (e.g., Wade's 1987 analysis of the relationship between resource scarcity and cooperation [84]). Even if the conceptualization of the inverted U-shaped curve is highly simplistic and unable to fully account for the complex relations between humans and their environment [85,86], the proposed model should be considered useful in a global context. Given this theory, we suggest that societies would derive some cohesive benefits from stressors inherent to the declining EROI of oil. These benefits may occur as a heightened sense of societal bonding derived from effective communication, constructive use of power, optimistic affect, and shared collective goals. These benefits will likely continue until society reaches the maximum theoretical advantage derived from increased perceived stress. Once this apex is exceeded, the fabric of society will begin to unravel.

Unfortunately, it is impossible for us to predict or define where the U.S. currently rests on the curve; only in retrospect will we be able to apply a timeline to this trend.

Figure 2. According to Torrance, as stress increases bonding forces increase until a theoretical apex is reached. A decline in the strength of integrating bonds then occurs even though the intensity of stress continues to rise.
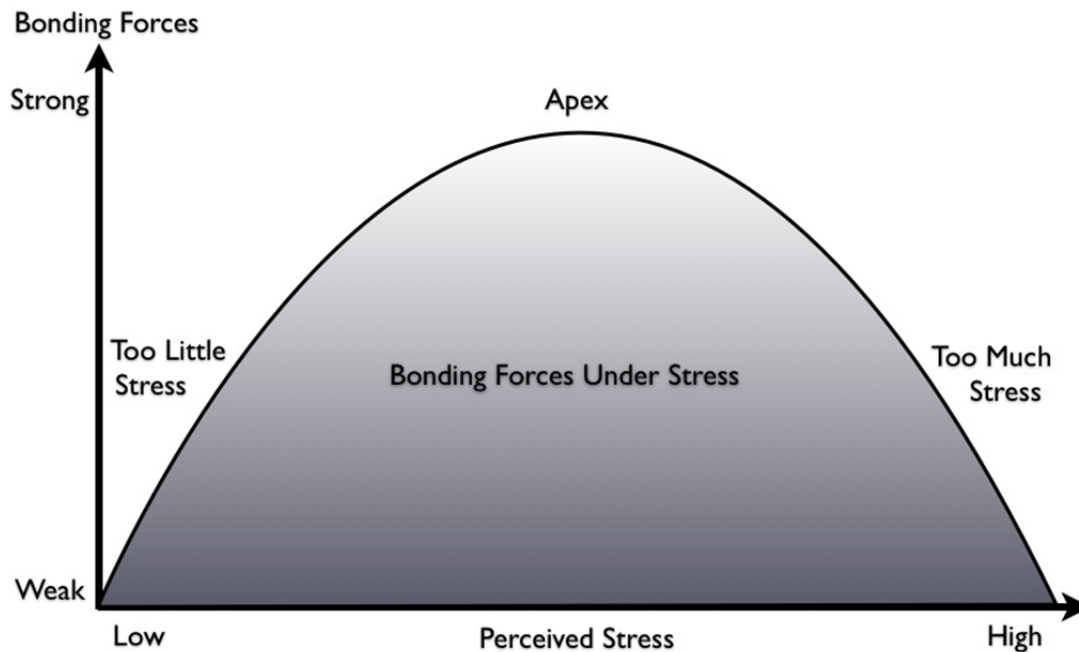
6.1. Communication

Communication, potentially the most readily apparent linkage among group members, is likely to be compromised under high degrees of perceived social stress. According to Torrance, the following conditions appear to be the most prominent in weakening communication linkages necessary for survival within the group [80]:

(1) Failure of a group member to inform others of what he/she is doing [87],
(2) Failure to pool information which would provide a basis for diagnosing the seriousness of the danger and reducing resistance to acceptance of its seriousness [88],
(3) Confining communication to dyads or cliques rather than to the entire group [88],
(4) Failure to use group judgments in making decisions, and the use of leadership techniques which interfere with this type of communication [89],
(5) Power differences which interfere with communication of information needed in decision-making [90], and
(6) Unwillingness to disagree in the decision-making process [91].

Torrance suggests that vertical communication, under stress that is perceived as moderate, becomes more frequent with increasing intensity and/or duration of stress. Once the degree of perceived stress exceeds the group's ability to effectively handle that stress, not only will vertical communications become less frequent, they will become muddled, often reaching only a select few within the group [78].

Famous examples of the impact of truncated vertical communication include President Nixon's infamous Watergate team [92] and President Kennedy's Bay of Pigs Crisis [93].

Applying general systems theory to Torrance's research, which means assuming that the societal level will be the same as the group level, we suggest that leaders of nations experiencing crisis situations are likely to direct fewer communications to the lower status group: the general populace. Those in positions of leadership will instead probably engage in lateral communication within a trusted leadership group while simultaneously reducing vertical communications directed toward mainstream society. The result will be that mainstream society will receive limited and delayed information concerning details of the crisis situation. According to Torrance, the opposite is also true at the group level; when lower group members perceive a large power distance between themselves and their leader, those lower group members may not feel accountable or obligated to communicate pertinent decision-making information with those in leadership positions [78]. To elucidate the severity of consequences to truncated communication within groups, Torrance recounts a story of a lieutenant colonel who was observed, by four crew members, to be sitting on his unattached dinghy during an over-water bail-out. The lieutenant colonel perished as none of these crewmembers felt an obligation to communicate his situation to him [78]. The combined effect of these diminished communication processes at both the group and societal levels is miscommunication, poor judgment, and incorrect decisions, sometimes with large consequences.

The establishment of effective communication among intergovernmental groups has, historically, been a common problem in government. Historically, this issue has been exacerbated by the propagation of competing objectives and personal agendas [94]. Recent United States Environmental Protection Agency (EPA) and Pentagon failures to communicate on superfund sites [95] provide an example. A second example of competing agendas and poor communication is the 2010 funding of a 600-megawatt wind energy production venture between U.S. and Chinese energy groups (U.S. Renewable Energy Group, Cielo Wind Power LP, and Shenyang Power Group) in western Texas [96]. Designed to bring renewable energy as well as installation and managerial jobs to the area, this project was stalled by negative press and congressional concerns regarding the manufacturing source (China) of component parts for the $450 million (USD) grant [96]. Many of these communication and agenda issues have been addressed through the formation of Federal government oversight taskforces and workgroups intended to target specific policy and social issues perceived as having overlapping or parallel agency efforts. Still, many groups seeking to maximize their own ability to receive "adequate gratification" from and cope with the impending oil crisis continue to exploit existing divisions amongst Federal, State, and regional agency efforts. Unless these communication and coordination issues are purposefully addressed and a common thread of understanding is reached, communication among groups will continue to be threatened by intra-group and inter-group stress.

6.2. Leadership and Power

According to Torrance, during times of perceived crisis, vertical communication tends to decrease and leadership groups typically do not seek decision-making input from lower-status individuals within the group [90]. There is constriction of control and limited downward informational communication to those in lower levels of the social hierarchy, as this is deemed non-essential and

perhaps dangerous [97,98]. Reduced vertical communication results in perceived social isolation from the leader, loss of confidence, and an aversion to further expansion and structuring of leadership. A breakdown in shared understanding between leaders and members of a group, results in greater horizontal informational communication within the social network/group [90]. We suggest that deterioration of hierarchical communication between the leaderships and the "rest of society" will compound any existing stress associated with the declining EROI of oil.

According to Katz, excessive stress may result in conflict within the current leadership group [99]. This is especially true if blame is attributed to members of the leadership [100] and typically corresponds with changes in authority and the leadership process [101]. D.W. Conrath's codicil to Torrance's research further elaborates upon changes in the leadership process; the expansion and structuring of leadership is directly linked to conditions of high perceived stress within the leadership sub-group [102]. The range of judgments considered by leaders during the decision making process is a function of group members' willingness to disagree. The correctness of a decision is positively related to the range of judgments considered [91]. Under conditions of extremely structured and consolidated power, low status persons are more reluctant to express their thoughts and opinions for fear of being found in opposition to high status individuals. Inability to communicate true opinions frequently leads to miscalculations in policy decisions and often makes the difference between continued societal unity and societal disintegration [103].

The Third Reich and German anti-Semitic sentiment are eloquently instructive on this point. The anarchy, chaos, and resource scarcity of the post-WWI era lead to changes in the German authority (from Kaiser Wilhelm II eventually to Hitler [104]) and leadership process (Monarchy to Democracy to Fascism [104]). The extreme structure and consolidated power of the Nazi regime following the severe stress of the post-WWI era, coalesced to produce a populous that willingly turned a blind eye to atrocities performed on people they previously called their neighbors. This example, while extreme, demonstrates the complete passivity of people under high degrees of stress when faced with the fear of being found in opposition to authority figures.

Expansion and increased structuring of leadership (*i.e.*, the systematic hierarchical and horizontal organization of leadership to establish, guide, and direct uniform compliance with group policy) during periods of perceived stress, is evidenced in almost every historically prominent government "power grab", e.g., Julius Caesar [105], Napoleon [106], and Hitler [107]. Structuring of the government, in these cases, was preceded by widespread societal fears of perceived crisis. Individually, group members typically do not desire expanded leadership and/or additional structuring of leadership [78]. A group's collective unconscious desire for direction and individual lethargy when faced with the gravity of a crisis situation, colludes to produce a perfect scenario for a political "power grab" and leadership structuring. Under these conditions, democratic processes tend to fail, liberties are eroded, and power is centralized under a central power figure or group. History has a way of repeating itself. Unless constructive changes to current energy policy are formalized and implemented, the United States may experience continued restructuring of leadership and progressive centralization of political power.

6.3. Affect and Goals

Positive group affect (the emotional milieu within a group) and group activity focused on the formation and attainment of group goals increase during moderately stressful conditions and are followed by a rapid decline upon reaching an apex of stress. This pattern occurs in situations of high intensity stress and/or when stressors continue unabated over a prolonged period of time [80]. A group's capacity to survive is dependent upon its skills in organizing its efforts. As a result, disorganized groups show signs of disintegration more readily than organized groups. The ability of a group to coalesce and maintain clarity of purpose is dependent upon its capacity to perform quick, adequate analyses of novel situations, provide clear and concise uniform communication among all group members and maintain the group goal of survival [78]. Random trial-and-error behavior, resulting from a lack of clarity of purpose and insufficient information, is detrimental to the attainment of group goals [108].

The U.S. involvement in Vietnam provides an example of altered group affect and splintered goals during a period of societal exposure to intense, unabated stress. After a very brief period of unified goals and optimism, the U.S. populace plunged into emotional turmoil and diametrically-opposing objectives [109]. This was a situation marked by intense as well as unabated stress as U.S. [110] military troops were exposed to guerrilla warfare on a scale and dimension never previously experienced. As the atrocities of jungle mayhem, news of the day's carnage, and seemingly astronomical American casualties blared across TV screens, the American populace splintered into factions; those opposing the war demonstrated in Washington and rioted on college campuses; those supporting the war effort picketed and campaigned for order at home [109]. The ability of the U.S. to quickly and adequately analyze its military situation was compromised, factions of society were set in opposition to one another, and the emotional tenor of the country as a whole was one of distress, all of which are recognizable signs of social disintegration.

Similarly, poorly organized effort and lack of clarity of purpose are currently evident in the unplanned development of renewable energy. There is an abundance of government and privately funded research in a sundry of "green" energy arenas with little coordination of efforts or evaluation of their net energy contribution. Experimentation within the transportation industry alone includes everything from ethanol to bio-diesel to hydrogen fuel cells, each of which is highly subsidized, highly subject to hype and rarely analyzed by objective science [111]. Industrial energy research areas include everything from effectively harnessing wind, to capturing solar energy using photovoltaic cells, and from diverting river and tidal currents, to growing algae, corn, and willow biomass. Each area initially promises to "solve" the potential U.S. energy crisis resulting from decline in oil reserves, yet each falls short of the necessary EROI to be considered an alternative comparable to oil [112]. If a nearly comparable solution is not found, disillusionment will likely follow. The uncertainty, engendered by unclear and contradictory communications and goals, will likely result in a breakdown of each individual member's ability to accurately decipher and predict their current and future circumstances [78]. This may result in unstable group affect (depression, apathy and ultimately surrender into hopelessness) as we face the real possibility that there may not be an effective and efficient alternative to the energy on which we so completely depend [113].

7. Integration *vs.* Disintegration

Hamblin found, "Present in every crisis situation is a solution that requires the cooperation of all or most of the members of the groups involved" [113]. During a crisis situation with no apparent solution, integration does not increase, rather it decreases. As each progressive solution fails, frustration mounts, and individual attempts at survival occur. Groups disintegrate when faced with a threatening situation and the solution involves individual competition. This pattern of evoked responses appears to be based in a simple rational model: if the likely solution to a crisis requires cooperative action, group integration increases. Group disintegration results when the crisis situation appears to either have no solution or the optimum solution requires individual action. According to Hamblin, groups remain together only if there are valid and functional reasons [113]. Society will remain intact only while there is a unified purpose that benefits the society as a whole. If the U.S. continues to dissipate its remaining energy on futile efforts to maintain a "business as usual" mentality, then the American public will squander its remaining opportunities to work together with unified purpose; to prepare for the energy crisis at hand.

Seyle's General Adaptation Syndrome (GAS) concurs with Hamblin's research on group disintegration. Seyle's research demonstrates stress reactions where the intensity of stress is so great, it exceeds the organism's maximum effective coping ability. GAS theory suggests that if stress exceeds an individual's ability to effectively cope (for our purposes, the point of optimum societal bonding/unity) then the reaction appears to follow a three-stage process: recover or resistance, exhaustion, and burnout [114]. Seyle's period of recovery or resistance is similar to the decreasing efficiency and effectiveness of society (evidenced by the initial declining side of the curve, Figure 2 as it clings to traditional energy practices while attempting to remediate the current energy crisis. Seyle's, Torrance's and Hamblin's paradigms all concur that should stress-causing events continue unabated, exhaustion sets in, followed by symptoms of burn-out including diminished responsiveness to the needs of others [114]. Groups disintegrate [91] and as each progressive solution fails, frustration mounts, and individual attempts at survival occur [113].

8. The Power of Unified Purpose

A society with a unified vision for resolving its "real" energy issues has the capacity to alter its projected energy path [115]. Concentrated focus on a crisis situation retards social growth and can exacerbate existing calamities [116]. A clear vision of a desired outcome leads to clarity of purpose among group members, a unified collective objective, and more coordinated pooled resources to achieve the desired outcome. Only through the application of unified purpose will the U.S., as a collective, be able to mediate its voracious use of energy and effectively utilize its remaining resources to wean itself from dependency on oil. Abraham Lincoln's comment appears salient; "You cannot escape the responsibility of tomorrow by evading it today" [117]. The current challenge for the U.S. and other energy intensive, oil driven Western cultures is to develop a shared vision for an energy independent future that:

(1) Acknowledges the biophysical constraints of reality,
(2) Effectively envisions the true collective objective,

(3) Clearly states goals, and

(4) Establishes flexible and evolving methods of implementation [118].

We suggests that unified purpose and vision would result in a comprehensive, adaptive, integrated, and biophysically-based process based on a collective understanding for reducing current and anticipated U.S. oil consumption. In practical terms, a unified purpose would provide the U.S. with a social process to determine how to best use existing natural resources, employ sustainable practices, and plan for an "energy independent" future. The actions we take today have the potential to exponentially affect the world of tomorrow. If steps are taken to avert the coming energy crisis and develop a low energy intensive society, we may still be able to avert many, and possibly all, of the above outcomes.

9. Summary

We have developed a framework for understanding possible Western societal reactions to stresses caused by the depleting quality and quantity of oil reserves by applying Boulding's understanding of general systems theory to Janis', Torrance's, and Hamblin's work on individual and small group reactions to stress. We examined past societal responses to perceived stress and possible future adaptive behaviors to energy (oil) scarcity using psychological and sociological frameworks originally designed for behavioral analysis at the individual and small group levels.

The U.S. has defined its energy security by extrapolating its current and future energy circumstances from an examination of its history. Historically, the U.S. has been capable of producing and procuring, for the last century and a half of rapid economic growth, all of the oil required for the "American way of life". With few exceptions, it has been able to do so unfettered by the biophysical realities of finite energy resources. As a result, the U.S. populace has generally ignored scientific evidence of depleting oil reserves and remained immersed in the day-to-day minutiae of life. We suggest that, if and when serious oil shortages become a reality, three defense mechanisms: denial, establishment of scapegoats, and an increased need to affiliate are likely to be employed to facilitate the continuance of this American myth of plenty and perception of invincibility.

U.S. foreign policies in the Middle East are manifestations of the interactive effect of all three defense mechanisms. The first defense mechanism is demonstrated as denial of the severity of U.S. dependence on foreign oil from countries with whom it is on less than friendly terms and the impact of this dependency. Continuous and favorable foreign oil trade is necessary for the maintenance of the U.S. and world economic status quo. The sense of and actual vulnerability created by this dependence on favorable foreign oil trade with potentially hostile nations helps establish a second defense mechanism: the sometimes latent, sometimes active, wish to establish scapegoats on whom aggression can be expressed and blame may be placed. This de-humanizing process facilitates discriminatory injustices and is used to justify aggressive actions taken by the U.S. against individuals, groups and nations defined as flawed and inadequate. Prejudicial stereotypes and cultural intolerance, once established, permits acts of aggression to be perceived as justified and perpetrated with minimal culpability. Individuals holding and espousing similar ideologies and embracing similar stereotypes find themselves drawn to one another. This increased need to affiliate with (the third defense mechanism) and share common opinions, beliefs, and feelings with like-minded people results in the

formation of sub-groups such as political splinter groups. This shared sense of unity culminates in a "we/they" mentality, perpetuating stereotyping, scapegoating and aggression. These defense mechanisms work in concert to create an exaggerated sense of invulnerability and a willingness to assert power, in the form of military might, in order to ensure the steady flow of oil necessary to maintain the world economic status quo and a sense of entitlement and justification.

We suggest that, despite continued scientific evidence of peak oil, oil depletion, and declining EROI, the U.S. populace will continue to exhibit these psychological and sociological defense mechanisms on a broad societal scale until sufficiently clear, irrefutable evidence to the contrary brings about a shift in perception and changes in actions. As the gap between increasing U.S. oil consumption rates, declining EROI of oil, and oil depletion expands, demands for government intervention programs (designed to combat growing unemployment and poverty) will probably increase. At the same time, economic paucity and recession will result in calls for decreased government spending cutting these very programs. As a result, the division between the "haves" and "have-nots" in American society will likely bolster affiliation within sub-groups on different sides of the issue. The influence of intense and unabated individual and societal stress created by the inevitable decreasing quantity and EROI of oil will likely adversely impact the interdependencies and linkages that bind society together. The impact on communication is clear: truncated communication not only separates leaders from their populace, it limits information flow. The result is poor decision-making at a time when quick, adequate analyses of new information and circumstances coupled with clear, concise, uniform communication among all group members is essential.

Faced with seemingly impossible challenges, a dearth of solutions, and unabated stress, leadership groups, the leaders and political party in power are likely to seek expanded influence and increased structure resulting in larger, more centralized political power. The American populace, driven by fears of economic and social repercussions resulting from oil depletion, will probably experience lethargy and an unconscious desire to be guided by those in positions of power. The gravity of the impending energy crisis, and the possibility that there may not be an adequate alternative to oil, will likely result in discordance between the American populace and those in positions of leadership. It is probable that this discordance will result in disillusionment within the populace and expanded and increasingly mistrusted and maligned centralized leadership.

The capacity for the United States to alter its current and projected economic and energy course is dependent upon its leaders' abilities to formulate and effectively communicate a clear vision and unified purpose in the energy field, establish clear renewable energy goals, commit to a rigorous energy-use reduction plan, prioritize energy research, and implement an energy policy that creates a viable energy future. The American populace will need to acknowledge the reality of biophysical constraints, and embrace a renewable, energy efficient "American way of life".

Acknowledgements

References and Notes

1. Tainter, J.A. *The Collapse of Complex Societies*; Cambridge University Press: Cambridge, UK, 1988; pp. 39-123.
2. Odum, H.T. Energy, ecology, and economics. *Energy Soc. A Spec. Issue* **1973**, *2*, 220-227.
3. Cleveland, C.J.; Costanza, R.; Hall, C.; Kaufmann, R. Energy and the U.S. economy: A biophysical perspective. *Science* **1984**, *225*, 890-897.
4. Hall, C.; Groat, A. Energy price increases and the 2008 financial crash: A practice run for what's to come? *Corp. Exam.* **2010**, *37*, 19-26.
5. *Annual Energy Review 2008, Table 1.3 Primary Energy Consumption by Source, 1949-2008*; U.S. Energy Information Administration: Washington, DC, USA, 2008.
6. Hall, C.; Klitgaard, K. *Energy and the Wealth of Nations: Understanding the Biophysical Economy*; Springer Publishing Company: New York, NY, USA, 2011; pp. 71-94.
7. Hall, C.; Day, J. Revisiting the limits to growth after peak oil. *Am. Sci.* **2009**, *97*, 230-237.
8. Gowdy, J.; Hall, C.; Klitgaard, K. The end of faith-based economics. *Corp. Exam.* **2010**, *37*, 5-11.
9. Hall, C.; Cleveland, C. Petroleum drilling and production in the United States: Yield per effort and net energy analysis. *Science* **1981**, *211*, 576-579.
10. Gagnon, N.; Hall, C.; Brinker, L. A preliminary investigation of the energy return on energy invested for global oil and gas production. *Energies* **2009**, *2*, 490-503.
11. King, C.; Hall, C. Relating financial and energy return on investment. *Sustainability* **2010**, *3*, 1810-1832.
12. Homer-Dixon, T. *Environment, Scarcity, and Violence*; Princeton University Press: Princeton, NJ, USA, 1999; pp. 29-86.
13. Inglehart, R.; Klingemann, H.-D. Genes, culture, democracy, and happiness. In *Culture and Subjective Well-being*; Diener, E., Suh, E.M., Eds.; MIT Press: Cambridge, MA, USA, 2000; pp. 165-187.
14. Lazarus, R.E.; Fulkman, S. *Stress, Appraisal, and Coping*; Springer Publishing Company: New York, NY, USA, 1984, pp. 144-285.
15. Hall, C.; Klitgaard, K. The need for a new, biophysically based paradigm in economics for the second half of the age of oil. *Int. J. Transdiscipl. Res.* **2006**, *1*, 4-22.
16. Hobföll, S.E. Conservation of resources: A new attempt at conceptualizing stress. *Am. Psychol.* **1989**, *44* 513-524.
17. Boulding, K.E. General systems theory—The skeleton of science. *Manage. Sci.* **1956**, *2*, 197-208.
18. Grosser, G.; Wechsler, H.; Greenblatt, M. *The Treat of Impending Disaster*; MIT Press: Cambridge, MA, USA, 1964; pp. 11-88.
19. Janis, I.L. *Psychological Stress*; John Wiley and Sons, Inc.: New York, NY, USA, 1958; pp. 13-199.
20. Jacobson, S.R. Individual and group response to confinement in a skyjacked plane. *Am. J. Orthopsychiatry* **1973**, *43*, 459-460.
21. Hall, C.; Cleveland, C.; Kaufmann, R. *Energy and Resource Quality: The Ecology of the Economic Process*; Wiley-Interscience: New York, NY, USA, 1986, pp. 34-68.

22. Campbell, C.; Laherrère, J. The end of cheap oil: Global production of conventional oil will begin to decline sooner than most people think, probably within 10 years. *Sci. Am.* **1998**, *278*, 78-84.

23. Freud, A. *The Ego and the Mechanisms of Defense*; Hogarth: London, UK, 1937, pp. 38-43.

24. Ayres, R.; Ayres, L.; Warr, B. Exergy, power and work in the US economy, 1900–1998. *Energy* **2003**, *28*, 219-273.

25. Ayres, R.; Warr, B. Accounting for growth: The role of physical work. *Struct. Change Econ. Dyn.* **2005**, *16*, 181-209.

26. Tertzankian, P. *A Thousand Barrels A Second: The Coming Oil Break Point and the Challenges Facing an Energy Dependent World*; McGraw-Hill: New York, NY, USA, 2006, pp. 23-58.

27. McConnell, D.; Hardemon, R.A.; Ransburgh, L.C. The logistics constant throughout the ages. *Air Force J. Logist.* **1999**, *23*, 20-23.

28. Berragan, G.W. High command and staff course staff ride paper: Who should bear primary responsibility for the culmination of Patton's US third army on the mosell in 1944? Are there lessons for contemporary campaign planning? *Def. Stud.* **2003**, *3*, 161-172.

29. Copaken, R.R. Oil as a strategic commodity. In *The New Global Oil Market: Understanding Energy Issues in the World Economy*; Shojai, S., Ed.; Praeger Publishers: Westport, CT, USA, 1995; pp. 217-224.

30. *International Energy Statistics, Crude Oil Proved Reserves (Billion Barrels)*; U.S. Energy Information Administration: Washington, DC, USA, 2009. Available online: http://tonto.eia.doe.gov/oil_gas/petroleum/info_glance/petroleum.html (accessed on 5 September 2010).

31. *World Factbook: Saudi Arabia*; U.S. Central Intelligence Agency: Washington, DC, USA, 2010. Available online: http://www.cia.gov/library/index.html (accessed on 19 October 2010).

32. *BP Statistical Review of World Energy, June 2010*; BP: London, UK, 2010. Available online: http://www.bp.com/statisticalreview (accessed on 10 December 2010).

33. Huber, M.T. The use of gasoline: Value, oil, and the "American way of life". *Antipode* **2009**, *41*, 465-486.

34. *SIPRI Yearbook 2010: Armaments, Disarmament and International Security*; Stockholm International Peace Research Inistitute: Solona, Sweden, 2010.

35. *Annual data from 1969 to 2009 (Table 1.1.5 Gross Domestic Product)*; U.S. Bureau of Economic Analysis: Washington, DC, USA, 2010. Available online: http://www.bea.gov/National/nipaweb2010/DownSS2_Test.htm (accessed on 29 October 2010).

36. Billon, P.L.; Khatib, F.E. From free oil to 'freedom oil": Terrorism, war, and US Geopolitics in the persian gulf. *Geopolitics* **2004**, *9*, 109-137.

37. Paust, J.J.; Blaustein, A.P. The Arab oil weapon—A threat to international peace. *Am. J. Int. Law* **1974**, *68*, 410-439.

38. Hiro, D. *Desert Shield to Desert Storm: The Second Gulf War*; Authors Choice Press: Lincoln, NE, USA, 1992; pp. 9-98.

39. Jhaveri, N.J. Petroimperialism: US oil interests and the Iraq war. *Antipode* **2004**, *36*, 2-11.

40. Hudson, M.C. To play the hegemon: Fifty years of US policy toward the middle east. *Middle East J.* **1996**, *50*, 329-343.

41. Bentley, R.W. Global oil & gas depletion: An overview. *Energy Policy* **2002**, *30*, 189-205.

42. Stern, R. Oil marketing power and United States national security. *Proc. Natl. Acad. Sci. U. S. A.* **2006**, *103*, 1650-1655.

43. Landau, M.J.; Solomon, S.; Greenberg, J.; Cohen, F.; Pyszczynski, T.; Arndt, J.; Miller, C.H.; Ogilvie, D.M.; Cook, A. Deliver US from evil: The effect of mortality salience and reminders of 9/11 on support for president George W. Bush. *Personal. Soc. Psychol. Bull.* **2004**, *30*, 1136-1150.

44. Noël, L. *Intolerance: A General Survey*; McGill-Queen's University Press: Montreal and Kingston, QC, Canada, 1994; pp. 11-76.

45. Janis, I.L. *Air War and Emotional Stress*; McGraw-Hill: New York, NY, USA, 1951, pp. 177-189.

46. Swann, C.; Pethokoukis, J. An inevitable slide for Americans' standard of living. In *The New York Times*. 7 October 2010. Available online: http://www.nytimes.com/2010/10/08/business/ 08views.html?src=busln (accessed on 19 October 2010).

47. Faunce, W.A. Automation and the division of labor. *Soc. Probl.* **1965**, *13*, 149-160.

48. Hecht, J. Classical labour-displacing technological change: The case of the US insurance industry. *Camb. J. Econ.* **2001**, *25*, 517-537.

49. Levine, L.A. *CRS Report for Congress: Offshoring (a.k.a. Offshore Outsourcing) and Job Insecurity Among U.S. Workers—RL32292*; United States Congressional Research Service: Washington, DC, USA, 2007. Available online: http://fpc.state.gov/documents/organization/ 93469.pdf (accessed on 5 December 2010).

50. Berman, E.; Bound, J.; Grilliches, Z. Changes in the demand for skilled labor with U.S. manufacturing: Evidence for the annual survey of manufacturers. *Q. J. Econ.* **1994**, *109*, 367-397.

51. Meyers, E. The causes of convergence in western immigration control. *Rev. Int. Stud.* **2002**, *28*, 123-141.

52. Mossakowski, K.N. The Influence of past unemployment duration on symptoms of depression among young women and men in the United States. *Am. J. Public Health* **2009**, *99*, 1826-1832.

53. Kiecolt, K.J. Group Consciousness and the attribution of blame for national economic problems. *Am. Polit. Res.* **1987**, *15*, 203-222.

54. Seeger, M.W. The Challenger tragedy and search for legitimacy. *Cent. States Speech J.* **1986**, *37*, 147-157.

55. Bratta, P.M. Flag display post-9/11: A disclosure on American nationalism. *J. Am. Cult.* **2009**, *32*, 232-243.

56. Parker, C.S. Symbolic *versus* blind patriotism: Distinction without differences? *Polit. Res. Q.* **2010**, *63*, 97-114.

57. Burney, S. Manufacturing nationalism: Post-september 11 discourse in United States media. *Stud. Media Inf. Lit. Educ.* **2002**, *2*, 1496-6603.

58. Salameh, M. *Peak Oil: A Reality or Hype?* USAEE Working Paper. Cleveland, OH, USA, 2008; pp. 5-11.

59. Mitchell, T. McJihad: Islam in the U.S. global order. *Soc. Text* **2002**, *20*, 1-18.

60. Pisarski, A.; Terra, N. American and European transportation response to the 1973-74 oil embargo. *Transportation* **1975**, *4*, 291-312.

61. Murphy, D.; Hall, C. Energy return on investment, peak oil, and the end of economic growth. *Ann. N. Y. Acad. Sci.* **2011**, *1219*, 52-72.

62. Knoop, T. *Recessions and Depressions: Understanding Business Cycles*; Praeger Publishers: Westport, CT, USA, 2004; pp. 141-190.

63. Ignotus, M. Seizing Arab oil: How the U.S. can break the oil cartel's stranglehold on the world. *Harper's Mag.* **1975**, March 1975, 45-62.

64. Carter, J. The moral equivalent of war. *Time Magazine*, 120, 1982. Available online: http://www.time.com/time/magazine/article/0,9171,949597,00.html (accessed on 20 March 2011).

65. Yahkelovich, D.; Kaagan, L. Assertive America. *Foreign Aff.* **1980**, *59*, 696-713.

66. Newman, P.; Beatly, T.; Boyer, H. *Resilient Cities*: *Responding to Peak Oil and Climate Change*; Island Press: Washington, DC, USA, 2009; pp. 15-34.

67. Belk, R.; Painter, J.; Semenik, R. Preferred solution to the energy crisis as a function of causal attributions. *J. Consum. Res.* **1981**, *8*, 306-312.

68. Yahkelovich, D. *Coming to Public Judgment*: *Making Democracy Work in a Complex World*; Syracuse University Press: Syracuse, NY, USA, 1991; pp. 115-137.

69. Farhar, B. The polls-poll trend: Public opinion about energy. *Public Opin. Q.* **1994**, *58*, 603-632.

70. Abrahamian, E. Mass Protests in the Iranian Revolution, 1977–79. In *Civil Resistance and Power Politics: The Experience of Non-violent Action from Ghandhi to the Present*; Roberts, A., Ash, T.G., Eds.; Oxford University Press Inc.: New York, NY, USA, 2009; pp. 162-178.

71. Fernández, D. Cuba in the Middle East. In *Cuban Foreign Policy: The New Internationalism*; Suchlicki, J., Fernandez, D., Eds.; University of Miami: Miami, FL, USA, 1985; pp. 127-174.

72. Hufker, B.; Cavender, G. From freedom flotilla to America's burden: The social construction of the mariel immigrants. *Sociol. Q.* **1990**, *31*, 321-335.

73. Harris, L. Soviet invasion of Afghanistan angers Americans. *ABC News-Harris Surv.* **1980**, *2*, 1-4.

74. Carter, J. *State of the Union Address 1980*; Department of State, Bureau of Public Affairs: Washington, DC, USA, 1980.

75. Meacher, M. Our Only Hope Lies in Forging a New Energy World Order. *The Telegraph*, 26 June 2006. Available online: http://www.telegraph.co.uk/finance/2941858/Our-only-hope-lies-in-forging-a-new-energy-world-order.html (accessed on 18 April 2011)

76. Jhaveri, N. Petroimperialism: US oil interests and the Iraq War. *Antipode* **2004**, *36*, 2-11.

77. Farhar, B.C. Trends in US public perception and preferences on energy and environmental policy. *Annu. Rev. Energy Environ.* **1994**, *19*, 211-239.

78. Torrance, E.P. Small groups under stress conditions. *Am. Sociol. Rev.* **1954**, *19*, 751-755.

79. Selye, H. Confusion and controversy in the stress field. *J. Hum. Stress* **1975**, *1*, 37-44.

80. Petrullo, L.; Bass, B.M. *Leadership and Interpersonal Behavior*; Holt, Rinehart and Winston: New York, NY, USA, 1961; pp. 104-113.

81. Diamond, J. Easter's End. *Discover Magazine*, 1 August 1995. Available online: http://discovermagazine.com/1995/aug/eastersend543 (accessed on 15 March 2011).

82. Goldsworthy, A. *How Rome Fell*; Yale University Press: New Haven, CT, USA, 2009; pp. 11-154.

83. Copeland, D.C. *The Origins of Major War*; Cornell University Press: Ithaca, NY, USA, 2001; pp. 11-34.

84. Wade, R. *Village Republics, Economic Conditions for Collective Action in South India*; Cambridge University Press: Cambridge, UK, 1987.

85. Hanoch, Y.; Vitouch, O. When less is more: Information, emotional arousal and the ecological reframing of the Yerkes-Dodson Law. *Theory Psychol.* **2004**, *14*, 427-452.

86. Baldi, E.; Bucherelli, C. The inverted "U-Shaped" dose-effect relationships in learning and memory: Modulation of arousal and consolidation. *Nonlinearity Biol. Toxicol. Med.* **2005**, *3*, 9-21.

87. Marshal, S.L.A. *Men Against Fire: The Problem of Battle Command*; William Morrow & Co.: New York, NY, USA, 1947; pp. 123-137.

88. Torrance, E.P. Techniques for studying individual and group adaptation in emergencies and extreme conditions. In *Air Force Human Engineering Personnel, and Training Research*; Finch, F., Cameron, F., Alfred, A., Eds.; Knopf Inc.: Washington, DC, USA, 1956; pp. 286-297.

89. Ziller, R.C. Scales of judgment: A determinant of the accuracy of group decisions. *Hum. Relat.* **1955**, *8*, 153-164.

90. Torrance, E.P. Some consequences of power differences on decision making in permanent and temporary three-man groups. In *Small Groups: Studies in Social Interaction*, Revised ed.; Hare, A.P., Borgatta, E.F., Bales, R.F., Eds.; Alfred A. Knopf Inc.: New York, NY, USA, 1965; pp. 600-609.

91. Torrance, E.P. Group decision—Making and disagreement. *Soc. Forces* **1957**, *35*, 314-318.

92. Gouran, D.S. The watergate cover-up: Its dynamics and its implications. Speech Communication Association: Houston, Texas, United States of America, 27 December 1975. Available online: http://eric.ed.gov:80/PDFS/ED112443.pdf (accessed on 17 March 2011)

93. Vandenbroucke, L.S. Anatomy of a failure: The decision to land at the Bay of Pigs. *Polit. Sci. Q.* **1984**, *99*, 471-491.

94. ENSR International. *Avoiding and Resolving Intergovernmental Conflicts with Interstate Natural Gas Facility Siting, Construction, and Maintenance*; The INGAA Foundation, Inc.: Washington, DC, USA, 2005.

95. German, B. *EPA and the Pentagon: A Failure to Communicate on Superfund Cleanups*. The Hill: Washington, DC, 17 August 2010. Available online: http://thehill.com/blogs/e2-wire/677-e2-wire/114627-epa-and-the-pentagon-a-failure-to-communicate-on-superfund-cleanups (accessed on 20 September 2010).

96. Burnham, M. *China's A-Power to Build U.S. Wind Turbines Factory*. The New York Times: New York, NY, USA, 17 November 2010. Available online: http://www.nytimes.com/gwire/2009/11/17/17greenwire-chinas-a-power-to-build-us-wind-turbine-factor-22742.html (accessed on 9 October 2010).

97. Staw, B.M.; Sandelands, L.E.; Dutton, J.E. Threat rigidity effects in organizational behavior: A multilevel analysis. *Adm. Sci. Q.* **1981**, *26*, 501-524.

98. Seeger, M.W.; Sellnow, T.L.; Ulmer, R.R. *Communication and Organizational Crisis*; Praeger Publishers: Westport, CT, USA, 2003; pp. 105-124.

99. Katz, R. The influence of group conflict on leadership effectiveness. *Organizational Behavior & Human Performance* **1977**, *20*, 265-286.

100. Gemmill, G. The Mythology of the Leader Role in Small Groups. *Small Group Research* **1986**, *17*, 41-50.

101. Hamblin, R.L. Leadership and crises. *Sociometry* **1958**, *21*, 322-335.

102. Conrath, D.W. Communications environment and its relationship to organizational structure. *Manage. Sci.* **1973**, *20*, 586-603.

103. Asch, S.E. Opinions and social pressure. *Sci. Am.* **1955**, *193*, 31-35.

104. Kitchen, M. *A History of Modern Germany 1800-2000*; Blackwell Publishing: Oxford, UK, 2006; pp. 203-315.

105. Meier, C.C. Caesar Divi filius and the formation of the alternative in Rome. In *Between Republic and Empire: Interpretations of Augustus and His Principate*; Kurt, A., Raaflaub, A., Toher, M., Eds.; University of California Press, Ltd.: Berkeley, CA, USA, 1990; pp. 54-70.

106. Brown, H.G. Ending the french revolution: Violence, justice, and repression for the terror to napoleon. *J. Interdiscip. Hist.* **2008**, *38*, 453-461.

107. Rath, J.; Schum, C.W. Fascist of authoritarian? In *Social Roots of European Fascism*; Larsen, S.U., Hagtvet, B., Myklebust, J.P., Eds.; Universitetsforlaget: Bergen, Norway, 1980; pp. 249-256.

108. Tyre, M.J.; Hippel, E. The situated nature of adaptive learning in organizations. *Organ. Sci.* **1997**, *8*, 71-83.

109. Groll, M. *Vietnam War Coverage on U.S. Television News Casts*; Munich, GRIN Publishing GmbH: Munich, Germany, 2004; pp. 7-15.

110. Allen, J. From morse to modem: Developments in transmission technologies and their impact upon the military-media relationship. In *War, Culture, and the Media: Representations of the Military in 20th Century*; Stewart, I., Carruthers, S.L., Eds.; Associated University Presses: Cranbury, NJ, USA, 1996; pp. 148-164.

111. *Alternative & Advanced Fuels, Alternative Fuels & Advanced Vehicles Data Center*; U.S. Department of Energy, Energy Efficiency & Renewable Energy: Washington, DC, USA, 2010. Available online: http://www.afdc.energy.gov/afdc/fuels/index.html (accessed on 9 October 2010).

112. Special Issue "New Studies in EROI (Energy Return on Investment)". Hall, C.A.S., Ed.; *Sustainability*, in press. Available online: http://www.mdpi.com/journal/sustainability/ special_issues/New_Studies_EROI/.

113. Hamblin, R.L. Group integration during a crisis. *Hum. Relat.* **1958**, *11*, 67-76.

114. Selye, H. The General-Adaptation-Syndrome. *Annu. Rev. Med.* **1951**, *2*, 327-342.

115. Rothbaum, F.; Weisz, J.R.; Snyder, S.S. Changing the world and changing the self a two-process model of perceived control. *J. Personal. Soc. Psychol.* **1982**, *42*, 5-37.

116. Weick, K.E. Enacted sensemaking in crisis situations. *J. Manage. Stud.* **1988**, *25*, 305-317.

117. McLellan, V.K. *Wise Words and Quotes*; Alive Communication Inc.: Colorado Springs, CO, USA, 1996; p. 229.

118. Costanza, R. Visions of alternative (unpredictable) futures and their use in policy analysis. *Conserv. Ecol.* **2000**, *4*, 1-5. Available online: http://www.ecologyandsociety.org/vol4/iss1/art5/. (accessed on 6 November 2011).