tors and despots (e.g., Adolf Hitler, Joseph Stalin), have been described as narcissistic. In addition narcissism has been examined as a potential factor in political terrorism. In criminology narcissistic personality traits are thought to predict criminal behavior, including murder, rape, assault, spousal abuse, and white-collar crime. Narcissism is also a key feature of a psychopathic personality, which is perhaps the most important personality profile for predicting serious criminal behavior.

Several significant issues remain unresolved in the scientific study of narcissism. First, there remains debate over the definition of narcissism. While there is strong agreement on key features of narcissism like grandiosity and low empathy, there is disagreement about the link between narcissism and feelings of depression or unhappiness. Some theorists argue that narcissism contains a component of depression or low self-esteem; others argue that narcissism is related to positive emotions. Still others argue that narcissism is linked to negative emotions and self-perceptions but that these feelings are experienced only at an unconscious level. Second, while there are several theories about the development of narcissism in individuals, there is no firm conclusion about its etiology. Some researchers argue that narcissism results from permissive parenting, while others argue that narcissism is a reaction to cold, controlling parents. Finally, the role of culture in maintaining narcissism is not well understood. Some researchers and theorists have identified a rising tide of narcissism, but the cause of this remains unclear.

SEE ALSO *Freud, Sigmund; Individualism; Leadership; Neuroticism; Obsession; Personality; Political Science; Psychology*

BIBLIOGRAPHY

American Psychiatric Association. 1994. *Diagnostic and Statistical Manual of Mental Disorders*. 4th rev. ed. Washington, DC: Author.

Freud, Sigmund. [1914] 1957. On Narcissism: An Introduction. In *The Standard Edition of the Complete Psychological Works of Sigmund Freud*, ed. and trans. James Strachey, vol. 14, 67–104. London: Hogarth.

Lasch, Christopher. 1978. *The Culture of Narcissism: American Life in an Age of Diminishing Expectations*. New York: Norton.

Morf, Carolyn C., and Frederick Rhodewalt. 2001. Unraveling the Paradoxes of Narcissism: A Dynamic Self-regulatory Processing Model. *Psychological Inquiry* 12 (4): 177–196.

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NASH EQUILIBRIUM

Nash equilibrium is a fundamental concept in the theory of games and the most widely used method of predicting the outcome of a strategic interaction in the social sciences. A game (in strategic or normal form) consists of the following three elements: a set of players, a set of actions (or pure-strategies) available to each player, and a payoff (or utility) function for each player. The payoff functions represent each player's preferences over action profiles, where an action profile is simply a list of actions, one for each player. A *pure-strategy Nash equilibrium* is an action profile with the property that no single player can obtain a higher payoff by deviating unilaterally from this profile.

This concept can best be understood by looking at some examples. Consider first a game involving two players, each of whom has two available actions, which we call *A* and *B*. If the players choose different actions, they each get a payoff of 0. If they both choose *A*, they each get 2, and if they both choose *B*, they each get 1. This "coordination" game may be represented as follows, where player 1 chooses a row, player 2 chooses a column, and the resulting payoffs are listed in parentheses, with the first component corresponding to player 1's payoff:

The action profile *(B,B)* is an equilibrium, since a unilateral deviation to *A* by any one player would result in a lower payoff for the deviating player. Similarly, the action profile *(A,A)* is also an equilibrium.

As another example, consider the game "matching pennies," which again involves two players, each with two actions. Each player can choose either heads (*H*) or tails

	A	B
A	(2,2)	(0,0)
B	(0,0)	(1,1)

Figure 1

	H	T
H	(1,−1)	(−1,1)
T	(−1,1)	(1,−1)

Figure 2

(*T*); player 1 wins a dollar from player 2 if their choices are the same, and loses a dollar to player 2 if they are not.

This game has no pure-strategy Nash equilibria.

In some cases, instead of simply choosing an action, players may be able to choose probability distributions over the set of actions available to them. Such randomizations over the set of actions are referred to as *mixed strategies*. Any profile of mixed strategies induces a probability distribution over action profiles in the game. Under certain assumptions, a player's preferences over all such lotteries can be represented by a function (called a *von Neumann-Morgenstern utility function*) that assigns a real number to each action profile. One lottery is preferred to another if and only if it results in a higher expected value of this utility function, or expected utility. A mixed strategy Nash-equilibrium is then a mixed strategy profile with the property that no single player can obtain a higher value of expected utility by deviating unilaterally from this profile.

The American mathematician John Nash (1950) showed that every game in which the set of actions available to each player is finite has at least one mixed-strategy equilibrium. In the matching pennies game, there is a mixed-strategy equilibrium in which each player chooses heads with probability 1/2. Similarly, in the coordination game of the above example, there is a third equilibrium in which each player chooses action *A* with probability 1/3 and *B* with probability 2/3. Such multiplicity of equilibria arises in many economically important games, and has prompted a large literature on equilibrium refinements with the purpose of identifying criteria on the basis of which a single equilibrium might be selected.

Nash equilibria can sometimes correspond to outcomes that are inefficient, in the sense that there exist alternative outcomes that are both feasible and preferred by all players. This is the case, for instance, with the equilibrium (*B,B*) in the coordination game above. An even more striking example arises in the prisoner's dilemma game, in which each player can either "cooperate" or "defect," and payoffs are as follows:

The *unique Nash equilibrium* is mutual defection, an outcome that is worse for both players than mutual coop-

	C	D
C	(2,2)	(0,3)
D	(3,0)	(1,1)

Figure 3

eration. Now consider the game that involves a repetition of the prisoner's dilemma for *n* periods, where *n* is commonly known to the two players. A pure strategy in this repeated game is a plan that prescribes which action is to be taken at each stage, contingent on every possible history of the game to that point. Clearly the set of pure strategies is very large. Nevertheless, all Nash equilibria of this finitely repeated game involve defection at every stage. When the number of stages *n* is large, equilibrium payoffs lie far below the payoffs that could have been attained under mutual cooperation.

It has sometimes been argued that the Nash prediction in the finitely repeated prisoner's dilemma (and in many other environments) is counterintuitive and at odds with experimental evidence. However, experimental tests of the equilibrium hypothesis are typically conducted with monetary payoffs, which need not reflect the preferences of subjects over action profiles. In other words, individual preferences over the distribution of monetary payoffs may not be exclusively self-interested. Furthermore, the equilibrium prediction relies on the hypothesis that these preferences are commonly known to all subjects, which is also unlikely to hold in practice.

To address this latter concern, the concept of Nash equilibrium has been generalized to allow for situations in which players are faced with incomplete information. If each player is drawn from some set of types, such that the probability distribution governing the likelihood of each type is itself commonly known to all players, then we have a *Bayesian game*. A pure strategy in this game is a function that associates with each type a particular action. A *Bayes-Nash equilibrium* is then a strategy profile such that no player can obtain greater expected utility by deviating to a different strategy, given his or her beliefs about the distribution of types from which other players are drawn.

Allowing for incomplete information can have dramatic effects on the predictions of the Nash equilibrium concept. Consider, for example, the finitely repeated prisoner's dilemma, and suppose that each player believes that there is some possibility, perhaps very small, that his or her opponent will cooperate in all periods provided that no defection has yet been observed, and defect otherwise. If the number of stages *n* is sufficiently large, it can be shown that mutual defection in all stages is inconsistent with equilibrium behavior, and that, in a well-defined sense, the players will cooperate in most periods. Hence, in applying the concept of Nash equilibrium to practical situations, it is important to pay close attention to the information that individuals have about the preferences, beliefs, and rationality of those with whom they are strategically interacting.

SEE ALSO *Game Theory; Multiple Equilibria; Noncooperative Games; Prisoner's Dilemma (Economics)*

BIBLIOGRAPHY

Cournot, A. A. 1838. *Recherches sur les principes mathématiques de la théorie des richesses.* Paris: L. Hachette.

Fudenberg, Drew, and Jean Tirole. 1991. *Game Theory.* Cambridge, MA: MIT Press.

Harsanyi, John C. 1967–1968. Games with Incomplete Information Played by Bayesian Players. *Management Science* 14 (3): 159–182, 320–334, 486–502.

Harsanyi, John C., and Reinhard Selten. 1998. *A General Theory of Equilibrium Selection in Games.* Cambridge, MA: MIT Press.

Kreps, David, Paul Milgrom, John Roberts, and Robert Wilson. 1982. Rational Cooperation in the Finitely Repeated Prisoner's Dilemma. *Journal of Economic Theory* 27: 245–252.

Nash, John F. 1950. Equilibrium Points in N-Person Games. *Proceedings of the National Academy of Sciences* 36 (1): 48–49.

Osborne, Martin J., and Ariel Rubinstein. 1994. *A Course in Game Theory.* Cambridge, MA: MIT Press.

von Neumann, John, and Oskar Morgenstern. 1944. *Theory of Games and Economic Behavior.* Princeton, NJ: Princeton University Press.

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NASSER, GAMAL ABDEL
1918–1970

Gamal Abdel Nasser, who served as president of Egypt from 1956 to 1970, was born on January 15, 1918, in the small village of Bani Mor in the Egyptian province of Assiut, where he lived for eight years. He came from a humble and poor background to become one of the most prominent and influential leaders in the Middle East and the third world. His father worked as a mail carrier in the Egyptian Ministry of Communication, a position that required him to move with his family from Bani Mor to Alexandria and finally Cairo, where Nasser lived for ten years. In his memoirs, Nasser spoke proudly of his humble origin. His poor background might have been behind his socialist tendencies and his commitment to improve the living conditions of Egyptian peasants and workers.

During his high school years, Nasser participated in student demonstrations against the British occupying forces. After receiving his high school diploma in 1937, Nasser entered the Egyptian Royal Military Academy, which started admitting sons of lower-income families in 1936. A year later, he joined the Egyptian army, where he met several of his future colleagues, including Anwar el-

Sadat (1918–1981) and Zakaria Mohyi El Deen, both of whom served as his vice presidents, and Abdul Hakeem Amer, who became a minister of defense. In 1942 Nasser was transferred to Sudan, where he and other officers founded the Free Officers, a secret revolutionary organization. The Free Officers was a secular nationalist movement that was opposed to the British occupation of Egypt, the "corrupt" royal family, and the domination of Egypt's economy and parliament by a small landowning class. In 1948 Nasser was a member of the Egyptian army that along with other Arab armies was sent to Palestine to thwart the establishment of Israel. The humiliating defeat of the Arab armies in the 1948 war raised his awareness of the Palestinian problem and the inefficacy of the existing Arab governments.

On July 23, 1952, Nasser and his Free Officers seized power and deposed the king. A year later, the Revolutionary Command Council of the Free Officers promulgated a new constitution, abolished the monarchy, and declared Egypt a republic. Though General Mohammad Naguib (1901–1984) served as the head of the government from 1952 to 1954, Nasser held the real power through his control of the Revolutionary Command Council. In November 1954 Nasser placed Naguib under house arrest, accusing him of knowing about an attempt by a member of the Muslim Brotherhood to assassinate Nasser.

In 1956 Nasser was elected president of Egypt, a position he held until his death in 1970. As president, Nasser created an authoritarian police state, banning political parties and suppressing political opposition, including the local communists and members of the Muslim Brotherhood. He ruled the country through the Arab Socialist Union, a government-controlled party.

Between 1956 and 1966, Nasser introduced several socialist measures, including the nationalization of various industries, private companies, and banks, and he expanded the public sector significantly. He also introduced agrarian reform, including the confiscation of 2,000 square miles of cultivable land from wealthy landowners, which he distributed to Egypt's poor peasants. The aim of these socialist measures was to improve the living conditions of the country's peasants and workers. Nasser contended in his book *The Philosophy of the Revolution* (1955) that Arab socialism was a prerequisite for Arab unity and freedom and for surmounting the social and economic legacy of colonialism.

In addition to his domestic socialist reforms, Nasser adopted an anti-Western and anticolonial foreign policy. Initially however, he tried to secure arms from Britain and the United States, and it was only after the two countries declined his request that he acquired such weapons from the Soviet Union and Eastern Europe. Along with Prime