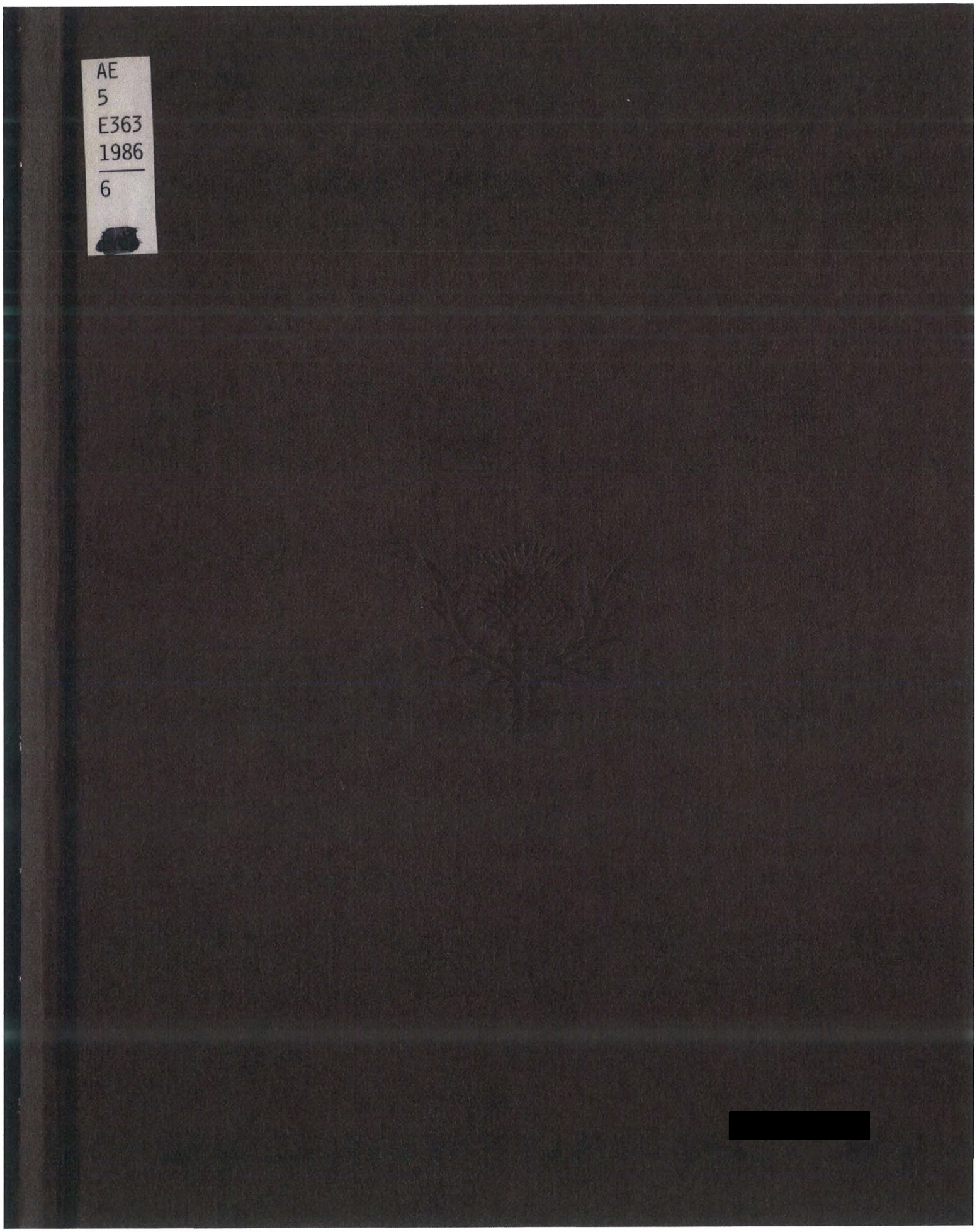
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MICROPÆDIA

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wandering from country to country, making arrests wherever they please; such representations are false—Interpol agents do not have such authority.

Interpol's principal target is the international criminal, of which there are three main categories: those who operate in more than one country, such as smugglers, dealing mainly in gold and narcotics; criminals who do not travel at all but whose crimes affect other countries—for example, a counterfeiter of foreign bank notes; and criminals who commit a crime in one country and flee to another.

At its headquarters, Interpol maintains a record of international criminals and others who may later fall into that category, containing particulars of their identities, aliases, associates, and methods of working, gathered from the police of the affiliated countries. This information is sent over Interpol's radio network or by confidential circular.

There are four types of confidential circular. The first type asks that a particular criminal be detained in order that extradition proceedings can be started. The second does not ask for detention but gives full information about the criminal and his methods. The third describes property that may have been smuggled out of the country in which a crime was committed. A fourth deals with unidentified bodies.

interpolation, in mathematics, the determination or estimation of the value of a function $f(x)$ from certain known values of the function. If $x_0 < \ldots < x_n$ and $y_0 = f(x_0), \ldots, y_n = f(x_n)$ are known, and if $x_0 < x < x_n$, then the value $f(x)$ is said to be an interpolation. If $x < x_0$ or $x > x_n$, $f(x)$ is said to be an extrapolation.

If $x_0, \ldots, x_n$ are given, along with corresponding values $y_0, \ldots, y_n$, interpolation may be regarded as the determination of a function $y = f(x)$ whose graph passes through the $n+1$ points (x_i, y_i) $(i = 0, 1, \ldots, n)$. There are infinitely many such functions, but the simplest is a polynomial $y = p(x) = b_0 + b_1x + \ldots + b_nx^n$. If $p(x_i) = y_i$ for $i = 0, \ldots, n$, $p(x)$ is called the polynomial interpolation through the points (x_i, y_i). There is exactly one such interpolating polynomial of degree n or less. Polynomial approximation is useful even if the actual function $f(x)$ satisfying $f(x_i) = y_i$ is not a polynomial, for it often happens that the value of the polynomial $p(x)$ is a good estimate for the value of $f(x)$.

If two points (x_0, y_0) and (x_1, y_1) are given, the polynomial interpolation is called the linear interpolation, for here $p(x) = a + bx$. The methods of analytic geometry give $b = (y_1 - y_0)/(x_1 - x_0)$ — that is, the slope of the line $y = p(x)$ — and the equation $y = p(x) = y_0 + b(x - x_0)$. To illustrate, suppose the population of a city is known to have been 304,000 in 1970 and 335,000 in 1980. The population in 1974 and in 1987 can be estimated by linear interpolation. (The latter estimate is an extrapolation.) We have $x_0 = 1970$, $x_1 = 1980$, $y_0 = 304$, and $y_1 = 335$, where the y's are measured in thousands. Thus $b = (y_1 - y_0)/(x_1 - x_0) = 31/10 = 3.1$, and the interpolating line is $y = 304 + 3.1(x - 1970)$. Setting $x = 1974$, we find $y = 316.4$ thousand as the population estimate in 1974, and setting $x = 1987$ we estimate 356.7 thousand as the population in that year. This latter extrapolation is also called the straight-line projection.

It would be foolhardy to take the above numbers as anything more than reasonable estimates. Few people would consider a straight-line projection to the year 2100 as meaningful, or in the other direction an extrapolation back to the year 1492. (The latter gives an estimated population of about minus 1,000,000.)

For $n+1$ points, the polynomial interpolation is especially easy to compute if the x_i's are equally spaced. Let $x_{i+1} - x_i = h$ and calculate the differences $\Delta y_i = y_{i+1} - y_i$ $(i = 0, \ldots, n-1)$, then the second differences $\Delta^2 y_i = \Delta y_{i+1} - \Delta y_i$ $(i = 0, \ldots, n-2)$, and so on. Then take $a_0 = y_0$, $a_1 = \Delta y_0$, $a_2 = \Delta^2 y_2$, etc. Then the polynomial interpolation through the points (x_i, y_i) is

$$f(x) = a_0 + \frac{a_1(x - x_0)}{h} + \frac{a_2(x - x_0)(x - x_1)}{2!h^2} + \ldots + \frac{a_n(x - x_0) \cdots (x - x_{n-1})}{n!h^n}.$$

This is called Newton's formula after its discoverer, Sir Isaac Newton.

To illustrate this formula, suppose that a table of values gives $f(3) = 1.3106$, $f(3.1) = 1.3200$, and $f(3.2) = 1.3310$, and estimate $f(3.15)$ by quadratic interpolation. Here, $h = 0.1$ and $x_0 = 3$. The y's are successively 1.3106, 1.3200, 1.3310. The first differences are .0094, .0110, and the second difference is .0016. Newton's formula gives

$$f(3.15) = 1.3106 + .0094\,\frac{.15}{.1} + .0016\,\frac{.15 \times .05}{.1^2 \times 2} = 1.3253.$$

(The first two terms give the linear approximation 1.3247.)

Similar formulas can be found if the x_i's are not equally spaced, but the computation is more cumbersome.

A list of the abbreviations used in the MICROPAEDIA *will be found at the end of this volume*

interrex, plural INTERREGES, in ancient Rome, a provisional ruler especially appointed for a period during which the normal constituted authority was in abeyance (the interregnum). The title originated during the period of the kings when an *interrex* was appointed (traditionally by the Senate) to carry on the government between the death of one king and the election of his successor. It was subsequently used in republican times for an officer appointed to hold the *comitia* for the election for the consuls when for some reason the retiring consuls had not done so.

In the regal period when the Senate, instead of appointing a king, decided to appoint *interreges*, it divided itself into 10 "decuries," from each of which one senator was selected. Each of these 10 acted as king for 5 days; and if, at the end of 50 days, no king had been elected, the rotation was renewed. It was their duty to nominate a king, whose appointment was then ratified or refused by the *curiae*. Under the republic, similarly, *interreges* acted for five days each. When the first consuls were elected, Spurius Lucretius held the *comitia* as interrex, and from that time down to the Second Punic War (218–201 BC) such officers were from time to time appointed. Thenceforward there is no record of the office until 82 BC, when the Senate appointed an *interrex* to hold the *comitia*, which made Sulla dictator. In 55, 53, and 52 BC *interreges* are again found, the last-mentioned being on the occasion when Pompey was elected sole consul.

interrogation, in criminal law, process of questioning by which police obtain evidence. The process is largely outside the governance of law except for rules concerning the admissibility at trial of confessions obtained through interrogation and limitations on the power of police to detain suspected persons against their will. *See also* confession.

In the United States relatively elaborate safeguards have been placed on the interrogatory powers of the police. In *Escobedo* v. *Illinois* (1964) and *Miranda* v. *Arizona* (*q.v.*), (1966), the Supreme Court required that the police inform a suspected person of his right to remain silent and of his right to have counsel present at his interrogation. These decisions were criticized as achieving questionable safeguards at great detriment to law enforcement. Some commentators pointed out that similar restrictions could not be found in the legal procedures of other countries. Most agreed that in Escobedo and Miranda, the Supreme Court stretched the constitutional requirements of right to counsel and freedom from self-incrimination for the purpose of achieving social justice for indigent defendants.

In Great Britain interrogation is regulated by the "judges' rules." If an officer has sufficient evidence that an offense has been committed, he must caution the suspect. After a suspect has been formally charged, he must be cautioned again before further questioning can take place. Continental European countries give their police far greater freedom to question suspects, but the power to hold a person on suspicion is limited in much the same manner as in Anglo-American countries. *See also* arrest; search and seizure.

Interrogation of the Old Men, The, Irish Gaelic AGALLAMH NA SEANÓRACH, also called DIALOGUE OF THE ANCIENTS, or COLLOQUY OF THE ANCIENTS, in Gaelic literature, the preeminent tale of the Old Irish Fenian cycle of heroic tales. The "old men" are the Fenian poets Oisín (Ossian) and Caoilte, who, having survived the destruction of their comrades at the Battle of Gabhra, return to Ireland from the timeless Land of Youth (Tír na nÓg) to discover they have been gone 300 years. They meet St. Patrick, who interrogates them about the deeds of Finn and the heroes of the past. Oisín joins his mother in a fairy mound; Caoilte travels with St. Patrick throughout Ireland, recounting the legends, history, and myths associated with each place they visit, while St. Patrick's scribe Brogan records the tales. This framework combines the traditional Irish *Dinnsheanchas* ("Histories of Places") with heroic legend and folklore. St. Patrick's delight in the tales and his desire to record them confirm the sympathetic attitude of monastic scribes to the pagan past.

The *Interrogation* was probably compiled from older sources and oral tradition by a single author in about 1200. Preserved in the 16th-century manuscript *The Book of the Dean of Lismore*, it is written in prose with verse passages that later gave rise to the Ossianic ballads.

intersex, in biology, an organism having physical characteristics intermediate between a true male and a true female of its species. The condition usually results from extra chromosomes or a hormonal abnormality during embryological development. The sex mosaic, or gynandromorph, is an intersexual organism that has male parts on one side of the body and female parts on the other. Arthropods, mammals, and birds have been known to be gynandromorphic.

interstate commerce, in U.S. constitutional law, any commercial transactions or traffic that cross state boundaries or that involve more than one state. The traditional concept that the free flow of commerce between states should not be impeded has been used to effect regulations, both federal and state. A further extension of the established notion regarding the free flow of trade was introduced when Title II of the 1964 Civil Rights Act (*q.v.*)—dealing with discriminatory practices in public accommodations—was upheld by the Supreme Court. The court decided that a business, although operating within a single state, could affect interstate commerce with its restrictive laws and was, therefore, at odds with the federal legislation that proved to be enabling of the Constitution's commerce clause (*q.v.*).