In the 1890s, US firms pioneered the use of vertical filing systems, greatly improving information retrieval. The technology spread to the US government in the early 20th century, including the State Department.

Three Pillars of Identity Intelligence

A Brief History

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A bleary-eyed traveler steps up to the passport control counter at Washington-Dulles International Airport. An official from US Customs and Border Protection (CBP) examines the traveler's passport and runs it through a machine to read the RFID chip embedded in its cover. The traveler provides fingerprints on a digital device. The official asks the traveler a few questions. From there, the traveler may be diverted to secondary questioning, or not. They may be denied admission to the United States, or not. Most likely, the traveler will simply proceed on their way, an experience shared by most of the 10 million-plus passengers who transit Dulles every year.

Such transactions are enabled by a mind-boggling array of screening and vetting activities, leveraging dozens of governmental databases (e.g., the Consular Consolidated Database, which in turn links to many others),[1] as well as private sector holdings initially developed by airlines, credit card companies, and other commercial entities to combat fraud.[2] The additional information collected at passport control is then fed back to the US Intelligence Community, a vital stream of intelligence about the movements of terrorists and other national security threats.

Three Pillars of Identity Intelligence

Identity intelligence, or I2, consists of two functions: identity discovery/reveal (or denying threat anonymity) and protect/conceal. This encapsulates identity modalities, enabling activities (biometrics, forensics, and document and media exploitation [DOMEX]), and identity attributes (biologic, biographic, and behavioral)." While neither a recognized collection discipline nor a traditional form of analytic tradecraft, I2 underpins a great deal of modern intelligence work.

What I2's largely unexplored history reveals, however, is that it has three prerequisites that did not exist before the 20th century:

- One or more reliable and immutable identity attributes that can travel with an individual
- A sophisticated method of information retrieval
- A robust administrative state, with a professional and incorruptible bureaucracy that can consistently collect, retrieve, and employ I2 with accuracy and integrity.

I2 cannot function without these three pillars, and wherever and whenever one of them falls short, I2 falls short as well.

To illustrate the importance of the three pillars, this article traces the history of each of them. I describe the invention of immutable identifiers, starting with how key developments in the 19th century gave rise to such a need, and how that need was then addressed through biometrics, civil registries, and medical records. Next, I trace the development of information retrieval, facilitated by both advances in data science and the revolution in business processes that accompanied the invention of the filing cabinet and later, the computer. Finally, I describe how the United States gradually built and continues to build an administrative state capable of consistently collecting and utilizing Personally Identifiable Information (PII), in immigration, law enforcement, and, much more recently, in intelligence.

Immutable Identifiers

The first pillar of I2 consists of one or more immutable identity traits, PII. In traditional agrarian societies, there was no real need for such information. Most people's identity was intimately connected to their local community, a small geographic area they would not leave for the duration of their lives. Personal identifiers connected solely to the body, as opposed to a body in a particular fixed place, were not necessary to maintain order because anonymity was effectively impossible in such a setting.

This changed with several key transformations in global human relations that occurred during the 19th century. Chief among them were the end of slavery and rise of migrant and indentured labor; the Industrial Revolution that concentrated populations in cities; changes in warfare; and immigration law that became integral to the modern nation-state.

The sovereign interest in both identifying individuals and monitoring their movement was set into motion when Britain ended slavery in its colonies in 1838. British colonies worldwide shifted to a system of indentured labor.[3] Plantation owners throughout the Americas began to enter into labor contracts directly with such individuals.[4]

The Industrial Revolution instigated large-scale migration from rural to urban centers, and with

Select Developments in Identity Intelligence, 1790s–1944

Year	Development	Category
1790s	French Revolution prompts civil registration in parts of Europe	Civil Registries
1792	US Congress defines duties of unsalaried consular officers	Immigration Enforcement
1836	UK enacts Births and Deaths Registration Act	Civil Registries
1838	UK ends slavery, spurs global market for migrant labor	Global Mobility
1849	California Gold Rush attracts Chinese immigrants fleeing Taiping Rebellion	Global Mobility
1858	Sir William Herschel begins experimenting with fingerprints for identification	Biometrics
1858	NYPD introduces "rogues gallery" of criminal photographs	Biometrics
1865	US establishes Secret Service to combat counterfeiting	Law Enforcement
1868	14th Amendment affirms birthright citizenship	Immigration Enforcement
1870s	Treasury investigation finds widespread corruption in consular corps	Immigration Enforcement
1882	Alphonse Bertillon develops body measurements for identification	Biometrics
1882	US enacts Chinese Exclusion Act	Immigration Enforcement
1885	Bertillon introduces modern mug shot	Biometrics
1890	US Census adopts punch-card technology, expands data collected	Information Retrieval
1890s	Filing cabinets begin to replace bound ledgers	Information Retrieval
1890	Bengali police officers develop retrieval algorithm for fingerprints	Information Retrieval
1891	Treasury creates Superintendent of Immigration	Immigration Enforcement
1892	Ellis Island opens to process immigrants; Marine Hospital Service created	Immigration Enforcement
1898	International Anti-Anarchist Conference adopts system to track radicals	Biometrics
1904	Scotland Yard trains US police on fingerprinting	Biometrics
1905	Congress directs fees collected by consular offices are deposited in Treasury	Immigration Enforcement
1906	State Department adopts numerical, subject-based filing system	Information Retrieval
1908	Justice Department creates Bureau of Investigation	Law Enforcement
1910	Angel Island opens as West Coast immigration processing facility	Immigration Enforcement
1913	J. Edgar Hoover learns information-retrieval techniques at Library of Congress	Information Retrieval
1914	State Department requires passport photographs	Immigration Enforcement
1917	US attempts to implement alien registration during World War I	Immigration Enforcement
1924	Immigration Act makes quota system permanent; US Border Patrol created	Immigration Enforcement
1924	Bureau of Investigation creates Identification Division	Law Enforcement
1933	Immigration and Naturalization Service created in Labor Department	Immigration Enforcement
1930s	Advances in data processing	Information Retrieval
1935	Bureau of Investigation becomes FBI	Law Enforcement
1940	INS moves from Labor to Justice Department	Immigration Enforcement
1944	US creates centralized alien registration system	Immigration Enforcement

Select Developments in Identity Intelligence, 1947–Present

Year	Development	Category
1947	National Security Act establishes modern US Intelligence Community	Intelligence
1951	Calvin Mooers coins the term "information retrieval"	Information Retrieval
1950s	First computer programming languages created	Information Retrieval
1960s	Algorithms developed to enable text searches	Information Retrieval
1967	FBI launches National Crime Information Center	Law Enforcement
1970s	Digital information retrieval systems (e.g., LEXIS) marketed to public	Information Retrieval
1977	Personal computers marketed to general public	Information Retrieval
1985	Alec Jeffrey discovers DNA's potential as individual identifier	Biometrics
1980s	Scientists worldwide collaborate on standards for facial identification	Biometrics
1989	Tim Berners-Lee invents the World Wide Web	Information Retrieval
1990s	State Department begins storing visa applications digitally	Information Retrieval
1999	FBI establishes the Integrated Automated Fingerprint Identification System	Biometrics
2001	State Department begins including photos of all visa applicants electronically	Biometrics
2003	Homeland Security Act passes in wake of 9/11 attack	Immigration Enforcement, Intelligence, Biometrics
2003	INS functions reorganized into Immigration and Customs Enforcement, Customs and Border Protection, US Citizen and Immigration Services	Immigration Enforcement
2003	National Media Exploitation Center established	Intelligence
2005	Congress passes REAL ID Act to standardize state-issued identification	Civil Registries
2006	US passports integrate RFID chips	Information Retrieval
2009	FBI forms Facial Identification Scientific Working Group	Biometrics
2013	"Identity Intelligence" appears in Defense Department Joint Publication 2-0, Intelligence	Intelligence
2025	REAL ID enforced on domestic flights	Civil Registries

that, a dramatic increase in commercial activity between strangers who required some form of identity verification.[5] The anonymity of urban life facilitated fraud and other types of crime, with a particularly dramatic increase in repeat offenses.[6] In Paris, for example, there was now a permanent criminal underclass of rural poor who moved to the city after bad harvests and would return no matter how many times they were expelled. French authorities needed a means of identifying those whom they labeled recidivists.

Trains and telegraphs facilitated a new age of warfare, featuring the movement of large-scale conscripted armies to fight battles far from home. Draft-dodgers, deserters, and soldiers alive and dead all needed to be identifiable. During the US Civil War, soldiers wanted to ensure that their bodies could be identified on the battlefields and returned home. Private vendors, seizing a rather morbid opportunity, began offering personalized disks before major battles.[7] Several decades later the

US Army would adopt what are now known as dog tags.

Finally, the global movement of migrant labor fostered racial tensions and desires for immigration restrictions, as the concept of the modern nation-state evolved into something racially, linguistically, and ethnically exclusive. In California, the discovery of gold in 1849 attracted fortune-seekers from China, many of them fleeing the Taiping Rebellion. They were at first welcomed, but as the gold rush petered out and the Chinese established businesses in the cities, white Californians began to resent the competition and eventually prompted passage of the Chinese Exclusion Act of 1882.

This law proved impossible to enforce, as it had to be reconciled with a complicated legal framework. The 14th Amendment to the US Constitution, adopted in 1868, extended citizenship to all those born or naturalized in the United States. While Chinese immigrants were not allowed to naturalize, their children born in the United States were citizens.[8] There were also treaty obligations between the US and China that authorized a certain amount of Chinese immigration in exchange for US access to lucrative Chinese markets. Chinese laborers who had arrived before 1882 were allowed to stay along with family members.

The United States attempted to manage these nuances through an elaborate system of certifications. A Chinese laborer in the United States wishing to return temporarily to China had to first obtain a "return certificate" from the collector of the port prior to departing. Upon arrival in China, they were then required to obtain from the Chinese government a "Canton" or "Section Six" certificate. In 1884, additional documentary requirements were added: now the "Section Six" certificate had to be verified and a visa issued by a US consular officer at the port of departure in China.[9]

This system quickly became an unfathomable mess, in which "sheriffs, court commissioners, and United States marshals and deputies were known to be in collusion with Chinese agents on the borders, and money seemed to smooth the way even at the ports of San Francisco and New York."[10] Four years later, Congress enacted an additional law requiring all Chinese in California to obtain a "certificate stating minute particulars concerning themselves and must supply photographs at a cost of three dollars each," as white Californians insisted it was impossible otherwise to tell individual Chinese apart.[11] Reliable identity verification had not yet been invented.

Biometrics

Amid this explosion in global mobility, the growth in 19th century commercial interactions between strangers was the original context for biometrics. In 1858, Sir William Herschel, a British administrator in Bengal, contracted with Rajyadhar Konai to supply the building material for a road leading into a village. Konai was just about to sign the contract, when, according to Herschel's account, "I stopped him in order to read it myself; and it then occurred to me to try an experiment by taking the stamp of his hand by way of signature instead of writing."[12] This launched Herschel into an obsessive hobby for the next 20 years, during which he came to realize that fingerprints do not change over time.

American and British police had by that time both begun to embrace photography and what became known as the "mug shot," with the first reported "rogues' gallery" featuring photographs of habitual criminals introduced by the New York Police Department in 1858.[13] For the French police, the problem of how to identify recidivists was taken up by Alphonse Bertillon, who pioneered the use of 11 different anthropometric measurements of criminal suspects: height, head width, little finger length, etc. He also developed precise guidelines for classifying eye color, lips, and ears, an important precursor to today's facial recognition technology.

The Bertillonage method quickly spread to the United

Fingerprints and hand prints of William Herschel, 1859–60. (Wikimedia)

States, Canada, Argentina, Bengal, and Great Britain in the 1890s. In 1898, the International Anti-Anarchist Conference in Rome even embraced it as a standard identification system to be used across Europe for tracking international terrorists and other radicals.[14] However, Bertillonage required extensive training and was often copied poorly by successive police entities and prisons, which either cut corners or introduced variants to the methodology. By 1906, any hope for international compatibility of records had been lost.

Meanwhile, at the 1904 World's Fair in St. Louis, Missouri, Scotland Yard sent a security contingent to protect Queen Victoria's jewels, among them, Sergeant John Ferrier, who offered classes on fingerprinting. Attendees included Mary Holland, who ran her own detective agency in Chicago and whose husband published a magazine for law enforcement professionals. Holland was enraptured by Ferrier's presentation and joined a group of nine Americans who studied with him for almost eight months.[15] She traveled to London, where she passed proficiency tests administered by Scotland Yard, and then evangelized the method throughout the United States.

Thus, it was the portable, easy-to-learn fingerprinting technology that eventually took hold in the early 20th century, remaining in wide use today despite other biometric identifiers since developed—iris scans, voice recognition, gait analysis, etc.—that might offer greater accuracy. As with Bertillonage, the sophistication and cost of such technologies can be prohibitive. In 1985, geneticist Sir Alec Jeffreys discovered that DNA strands are unique enough to be accurately linked to individuals, and in subsequent years he began assisting with missing persons cases and murder investigations. However, even today, many police forces do not have the funding or forensic expertise to carry out DNA testing or store DNA evidence properly.[16]

Civil Registries

In 2000, Prof. Latonya Sweeney observed that 87 percent of all

persons in the United States could be individually identified through only three attributes: zip code, gender, and date of birth.[17] While this revelation was startling, it is a well-known practice among Internet-based services to request a person's date of birth as a form of authentication. The usage of such biographic data for identity verification and I2 was made possible by the 19th century development of civil registries.

The French Revolution and subsequent conquest of neighboring states initially brought about the adoption of civil registration in parts of Europe starting in 1792.[18] However, it was largely in response to the increase in 19th century global mobility that multiple other modern nation-states began to establish central registries for births, marriages and deaths. Great Britain, for example, enacted the Births and Deaths Registration Act in 1836.[19] In Japan, one of the first laws passed during the Meiji Restoration that returned the monarchy to power was the Family Registration Law of 1872.[20]

But the use of PII out of central registries continues to have limitations arising out of their history. First, the ability of a personal detail to identify one person to the exclusion of others varies considerably between cultures. In Pakistan and Afghanistan, for example, large swaths of visa applicants list their date of birth as 1 January. In cultures where birthdays aren't celebrated, individuals often select 1 January as their date of birth simply because it is easy to remember.[21]

Second, there is a long history of civil resistance to the centralization and standardization of such data that continues to this day. In Britain, the 1836 law was met with widespread noncompliance and rioting.[22] Brazil implemented a civil registration decree in 1852 that it then quickly rescinded amid a popular uprising that sent the local registrars fleeing for their lives.[23]

In the United States, vital records as well as drivers' licenses remain the province of state and local governments. In 1976, the Federal Advisory Committee on False Identification issued an 800-page report detailing how insufficient controls over birth certificates facilitated the widespread issuance of fake IDs by state and local governments, which criminals could then parlay into fake federal identification such as US passports.[24] By 2000, the US Department of Health and Human Services (HHS)—having acquired new immigration enforcement responsibilities in 1996—was still grappling with the same problem, noting that there were over 14,000 different versions of birth certificates in circulation issued by 6,422 different entities, rendering fraud detection exponentially more difficult.[25]

In response to the 9/11 terrorist attacks, the federal government enacted the REAL ID Act in 2005 to at least standardize the forms of state and local ID that could be used to enter federal facilities. The deadlines for compliance were repeatedly extended until 2025 because of popular resistance and bureaucratic foot-dragging.[26]

Medical Records

Medical PII in the United States is also intimately intertwined with US immigration policies that emerged in the late 19th century, developing contemporaneously with the opening of the Ellis Island processing facility in 1892. Doctors and hospitals were at the time keeping records in ledger books and sometimes handwritten diaries, with no standardized approach for recording a patient's clinical history. But with the Immigration Act of 1891, there was now a new category of immigrants who could be excluded from admission to the United States: "persons suffering from a loathsome or a dangerous contagious disease."[27] This meant that medical professionals would need to be on hand at Ellis Island and other ports of entry to inspect each and every person arriving. The task was assigned to the Marine Hospital Service, which would be rebranded as the US Public Health Service (PHS) in 1912.[28]

The standardization of medical examinations that resulted from these thousands of immigrant examinations was particularly

impactful because it occurred alongside a similar effort with respect to patient records. Starting in the late 19th century, Harvard Medical School—inspired by the "case histories" being compiled over at the Harvard Law School—began developing clinical records templates complete with empty fields to enter family history, patient habits, blood and urine test results, etc. The innovation came at a fortuitous time for hospitals, which were at the same time making their own significant transition from handwritten to standardized typescript records.[29] To the extent medical PII can be leveraged into identity intelligence today, it is largely a legacy of this history.

Information Retrieval

The second pillar of I2 is information retrieval, a term coined in 1951 by Calvin Mooers, who defined it as "the process of finding stored information when the approximate subject is known." He distinguished it from "information warehousing," which is simply "the orderly storage and warehousing of information."[30] The importance of the distinction is readily apparent with regard to biometrics. A collection of fingerprints, indexed alphabetically by a person's name, is effectively useless. It is only when one can match fingerprints to names rather than names to fingerprints that the collection can support investigative work.

In general, as data scientist Vannevar Bush presciently observed in 1945, the human mind operates by association: "With one item in its grasp, it snaps instantly to the next that is suggested by the association of thoughts, in accordance with some intricate web of trails carried by the cells of the brain."[31] The storage of large volumes of PII can help overcome the limitations of human memory, but it cannot support activities like identity intelligence without a retrieval system that can approximate our thinking patterns.

In that sense, the real revolution in fingerprinting did not occur until the 1890s, when two Bengali police sub-inspectors, Qazi Azizul Haque and Hem Chandra Bose, worked out a mathematical formula that would enable effective information retrieval. They observed that 60 percent of all fingerprint patterns are loops, 35 percent are whorls, and only 5 percent are arches. By combining arches and loops into a single category, they were left with only two categories for finger ridges. All 10 fingers were then grouped by pairs: right index/right thumb, right middle/right ring, left thumb/right little, left middle/left index, and left little/left ring. This led to a calculation of 1,024 possibilities for fingerprint combinations. The square root of 1,024 is 32, so if a criminal-record room had 32 cabinets, and each cabinet had 32 files, each of the 1,024 permutations could be given a numerical value, such that an official searching for a particular combination of fingerprints would be able to find this pattern, e.g., in the second file of cabinet 17.

Haque and Bose took their idea to the Inspector General of the Police in Bengal, Sir Edward Henry, who shared it with Scotland Yard. Henry shamelessly took full credit for the innovation, eventually becoming head of a new Fingerprint Bureau and branding the method the Henry Classification System.[32] This was the system on which Scotland Yard trained Americans during the 1904 World's Fair in St. Louis.

Even this innovation would not have been possible if not for a simultaneous change in business practice. For most of the 19th century, Western courts tended to look solely to records in bound ledger books as authoritative evidence in commercial disputes. Consequently, bound ledger books were how most business entities maintained their records. No evidentiary weight would have been given to a collection of loose papers in a manila folder, even if businesses had appropriate filing systems to house such folders.[33]

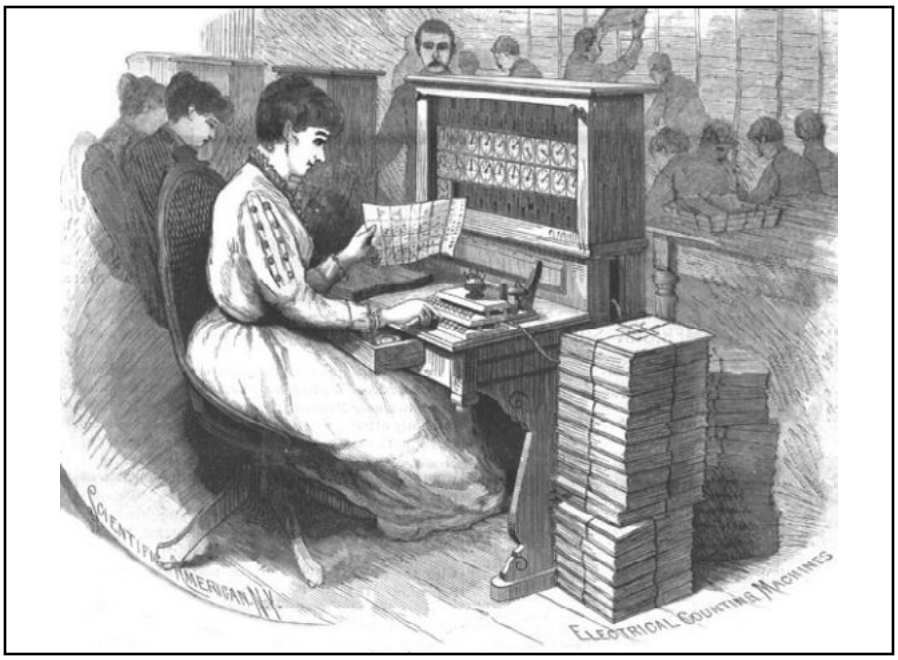
The adoption of filing cabinets and removable files started mostly in the commercial sector, with government sometimes lagging. In 1905, Secretary of State Elihu Root, who had come from private

legal practice, asked for a handful of letters and instead, to his exasperation, found several large bound volumes dropped on his desk. He felt, he said, as if he were "a man trying to conduct the business of a large metropolitan law firm in the office of a village squire."[34]

Other times, government led the way. The US Library of Congress, starting in 1899, established a Government Printing Office facility inside the library and began printing millions of standardized cards utilizing the Dewey Decimal System, not only for the library's holdings but for hundreds of libraries across the country that were willing to pay for the cards at a 10-percent markup to conform to the new de facto national standard.[35] In 1913, a young law school graduate named John Edgar Hoover got a job in the library's "order division," placing himself at the cutting edge of information technology and acquiring skills and disciplines that would serve him well for decades to come.[36]

The Advent of ADP

But a sophisticated approach to information retrieval of the type Bush and Mooers envisioned was not possible until the advent of automated data processing. The US Census of 1890 was for the first time powered by a processing machine using punch-card technology, developed by a federal civil servant named Herman Hollerith. His invention enabled



Census Bureau workers processing data on Hollerith Machines. Census Bureau image.

the collection and analysis of much more nuanced and detailed census information. Whereas in 1870 only five census topics were asked, now an army of census takers could posit 235 questions. [37]

Hollerith sold his invention to the Computing-Tabulating-Recording Company, or CTR, headed by Thomas J. Watson. One day a CTR employee suggested a name for a new company newsletter, International Business Machines. Watson realized that the name described the company itself, and from that day forward the company was known as IBM.[38] By the 1930s, Hollerith punch cards gained widespread use in industry and government, including wartime efforts by Allied and Axis powers to identify and track classes of individuals.[39] While eventually displaced by digital computers, punch cards are still sometimes used today for tabulation of voter data.

The digital computer was first conceptualized in the late 1930s by Alan Turing, who would go on to lead wartime cryptographic efforts at Bletchley Park; and by John Atanasoff, who co-developed the first electric-only computer in 1941. By the 1950s the first computer programming languages were developed. These advances in turn enabled the creation of the System for the Mechanical Analysis and Retrieval of Text (SMART), developed at Cornell University in the 1960s, which could search text and produce results based on relevance using an algebraic model that translated text into "vectors" and then calculated the similarity

between a query and a document based on the distance between two or more vectors.

Once text searches could return results based on relevance, the market for commercial applications was obvious. In 1972, the year two US government databases containing scientific research were made available to the public, Lockheed's DIALOG retrieval system was introduced to curate searches within them. That same year, the service Medline was launched to search a database held by the National Library of Medicine, and in 1973, LEX Information Service, or LEXIS, was launched to serve attorneys.[40]

Enter the PC and Internet

With the arrival of the personal computer and the internet in the 1980s and 1990s, the market for online searches exploded. Information retrieval was no longer the exclusive province of scientific and legal research and more closely resembled the world we know today, in which search engines and artificial intelligence (AI) can be used by virtually any person for any purpose. The everyday nature of online purchases, carried out between strangers who lack even a transitory face-to-face interaction, has only furthered the need for new methods of identity verification and fraud detection, facilitated by increasingly sophisticated information retrieval technology. The lawyers' research tool LEXIS has enthusiastically expanded into this space; it rebranded itself LEXIS-NEXIS after a 1994 merger and now provides a wide variety of identity resolution services to both commercial and government customers.

Establishment of an Administrative State

Finally, the third pillar of I2 consists of professional personnel. There could not be an activity called Identity Intelligence without a robust administrative state, as illustrated by the failed implementation of the Chinese Exclusion Act of 1882. This section discusses the professionalization of immigration enforcement, the growth of federal law enforcement, and finally, the establishment of a permanent US Intelligence Community and its very recent interest in identity intelligence.

In 1882, the United States was still deeply committed to small government, particularly at the federal level. There would be no federal superintendent of immigration until 1891. Angel Island, the West Coast counterpart to Ellis Island, did not open until 1910. The United States also had not yet adopted the use of the passport as a form of identification needed to cross international borders.[41]

China, by contrast, had a 1,000-year head start at navigating complex bureaucracies, which is how the elaborate system of certifications envisioned in the Chinese Exclusion Act quickly degenerated into bribery and falsified documents. The registration requirement for all Chinese nationals in California was supposed to be implemented by the US Treasury Department. A year later, only 13,242 out of 106,668 had registered, due to lack of enforcement capacity.[42]

Pre-screening immigrants overseas also was severely limited by the nature of the US consular corps, which had been established by Thomas Jefferson as an unsalaried service; consular officers were simply commissioned by the US government and expected to live off of whatever remuneration they could personally extract overseas by virtue of their status.[43]

The problem with maintaining a service of this nature should have been obvious. By the time a senior Treasury official conducted a worldwide investigative tour of US consulates in the 1870s, there were numerous reports of US consuls pocketing consular fees, including those designated for destitute seamen; maintaining "questionable jail accounts" in Japan; carrying out serious miscarriages of justice and abuses of power in both civil and criminal proceedings; selling "vice consul" offices to Egyptian nationals; and in Peru, being an "utterly hopeless inebriate."[44]

In 1905, Secretary of State Elihu Root joined forces with Senator Henry Cabot Lodge, resulting in the Lodge Act of 1906,[45] which for first time provided for salaries for consular officers and mandated that all fees collected for consular services go to the US Treasury.[46]

Impact of World War I

World War I prompted a dramatic increase in the State Department's administrative capacity, as it now needed to issue passports to its own citizens on a large scale, as well as undertake measures to combat passport fraud. Americans in Europe at the outbreak of hostilities suddenly needed identification that would satisfy European authorities while crossing the national boundaries of warring states. On August 1, 1914, the State Department authorized all US ambassadors and ministers in European countries to issue emergency passports to US citizens upon request.[47] A month later, the State Department had to issue some supplemental instructions to check birth certificates or some other form of "satisfactory identification" first, as Europeans were applying for US passports as a means to evade military service.[48]

In November 1914, authorities in Britain apprehended a German spy using a fraudulent US passport. British lawmakers responded with a new requirement for photographs and a physical description on all British passports.[49] A month later, the State Department was also requiring passport applicants overseas to submit photographs in triplicate.[50] The following year it beefed up its requirements for issuance of passports in the United States as well, following Executive Order 2285, which stated that "all persons leaving the United States for foreign countries should be provided with passports of the Governments of which they are citizens."[51]

Upon its own entry into World War I, the United States attempted to implement a system of nationwide enemy alien registration modeled after Canada's. In November 1917, President Wilson issued a regulation requiring completion of a four-page form that included family information, details of immigration, a physical description, a photograph, and fingerprints. Approximately 480,000 German enemy aliens were registered.

However, because of the lack of federal personnel to either oversee the program or leverage the information collected, the registration was carried out in such decentralized fashion that the impact of the program was dubious at best. Enemy alien registration records from this era have been identified at a variety of locations, including state archives, historical societies, and county libraries.[52] The Immigration and Naturalization Service would not be established until 1933, and the centralized alien-registration system known today as the "A-files" did not exist until 1944.[53]

The United States also had little control over its land borders. With the drop-off in immigration of unskilled laborers from Europe that accompanied the outbreak of World War I, the US government created the Bracero Program to invite in workers from Mexico to support the agricultural and railroad industries under an officially sanctioned program. By 1917, responsibility for overseeing immigration had shifted from the Treasury Department to the Bureau of Immigration within the Labor Department.

The 1917 implementing rules issued by this new bureau governing inspection on the Mexican border, specifically contemplated the admission of aliens "who enter the United States with the avowed intention of remaining for a temporary period only and who, on the basis of such claim, are not required to undergo the detailed inspection enforced in the cases of aliens who declare an intention of remaining permanently." Apparently, these expressions of intent were supposed to work on the honor system, with predictable results. Bracero laborers stayed for some years, had children who acquired birthright citizenship, and were eventually forcibly repatriated—along with some of their

US citizen children—in the early 1930s.[54]

Immigration Enforcement

With the cessation of hostilities in Europe and the redrawing of national borders at the 1919 Versailles Conference, the United States saw a surge in European immigration on the East Coast and Asian immigration to Hawaii and the West Coast. In 1921, Congress enacted the Emergency Quota Act,[55] creating a quota system for European immigrants based upon their proportionate national origin representation in the census (a level of detail made possible by Hollerith's tabulation machine). The quota system was then made permanent in the Immigration Act of 1924,[56] which for the first time provided for the issuance of immigration visas by consular officers worldwide. No immigrants would now be admitted to the United States without an unexpired immigrant visa (Asians were excluded entirely).[57]

Supporting Elements

The sophisticated method that underpinned the quota system, and the general goal of carefully limiting US immigration, would not have been possible had Congress not contemporaneously revamped and expanded the federal civil service in two key areas.

First, the Foreign Service Act of 1924[58] combined the State Department's diplomatic and consular services into a single civil service bureaucracy with its own system of promotion based on merit, standard rank-in-person pay scales, and retirement benefits.[59] There was now, finally, a corps of professionals in place with a clear chain of command, who could be trusted to build and maintain what eventually evolved into the Consular Consolidated Database, so essential to screening and vetting today.

Second, two days after the passage of the Immigration Act, Congress appropriated additional funds for land-border patrol within the Bureau of Immigration.[60] This is generally regarded as the official birth date of the US Border Patrol. That said, providing staffing sufficient to consistently monitor all movement across the 7,500 miles of US land borders was a challenge. The 1924 appropriation provided for only 472 patrol officers.

Wholly lacking in resources and guidance from Washington and often placed in situations of great danger, they were heavily reliant on the large landholders of southern Texas and California for support, and accordingly, enforced border controls in a manner conducive to the landholders' interests, allowing unhindered border crossings of some Mexican laborers while not hesitating to exercise extreme violence against others who were seen as troublemakers.[61] The Mexican government as well entered into special arrangements with local Border Patrol officials for the deportation of political exiles from Texas back to Mexico, where some were assassinated upon arrival.[62]

The Border Patrol was incorporated into the INS with the latter's founding in 1933. By 1939 it had sufficient funds to employ 913 personnel. By 1980 it had only expanded to 2,268 agents, but by 2001 there were 9,651.[63] The functions of the INS were absorbed into the Department of Homeland Security in 2002, with the Border Patrol assigned to CBP. It is CBP that now collects PII at ports of entry into the United States.

Law Enforcement

Until 1908, when the US Department of Justice established a Bureau of Investigation, the only federal law enforcement entity was the Secret Service, created in 1865 to combat counterfeit paper currency and acquiring its protective mission in 1901 after the assassination of President McKinley.[64] In the meantime, the nation's first biometrics collection was maintained by the National Chiefs of Police Union, initially consisting of photographs and Bertillon records, some donated by the Pinkerton Detective Agency, and later fingerprints.

The Bureau of Investigation stumbled along amid political scandals and limited staffing for

several decades, finally hitting its stride in the 1930s fighting the organized crime that had resulted from the Prohibition era. Under the leadership of J. Edgar Hoover, who had learned the value of information retrieval from his time at the Library of Congress, the bureau established an Identification Division in 1924, was renamed the Federal Bureau of Investigation in 1935,[65] and by the 1960s was a national standard-setter for criminal investigations.[66]

The FBI created the National Crime Information Center in 1967, initially tying 15 state and city computers into the FBI's central computer.[67] As late as the 1980s, however, police still had no practical method for comparing fingerprints recovered at a crime scene with the millions kept on file.[68] It was not until 1999 that the FBI established the Integrated Automated Fingerprint Identification System, and while IAFIS bills itself as the largest biometric database in the world, it still only receives contributions from state and local entities on a purely voluntary basis.[69]

Intelligence

The United States had no permanent national-level intelligence apparatus until 1947. Typically, military intelligence expanded for war and then drastically contracted during peacetime along with the rest of the armed forces.

The precursor to DOMEX was document exploitation or DOCEX, which had its origins in the American Expeditionary Force during World War I. The G-2 that supported the AEF with intelligence was trained on the examination of German prisoners and documents in their possession.[70] However, DOCEX was seen for many decades afterward as having limited operational value. During World War II, the 1st Army in Europe had just five people assigned to DOCEX. It was not until the post-9/11 counterterrorism effort that the military needed to identify and monitor individual as opposed to nation-state actors. The National Media Exploitation Center was established in 2003 to coordinate what is now known as DOMEX.[71] The term "identity intelligence" first appeared in military terminology in Joint Publication 2-0, Joint Intelligence, in October 2013.[72] Subsequent initiatives have further served to combine the resources and expertise that were each developed separately in the immigration, criminal justice, and intelligence fields.

Facial Identification

The fight against terrorism also breathed new life into the field of facial identification (FI), with many spillover benefits for DOMEX. While fingerprints as a biometric identifier continue to have many advantages over "mug shots," after 9/11 federal agencies realized that there was a dearth of fingerprint records on terrorists.

This renewed governmental interest in and support for FI. While Bertillonage had long since fallen out of favor, forensic scientists worldwide still had been working on consensus standards for FI since the 1980s, building off of Bertillon's classification of ear, nose and other facial features to support a method now known as "morphological analysis." In 2009 the FBI formed the Facial Identification Scientific Working Group to convene the world's experts around further international harmonization of standards. But the FISWG has to keep developing new standards, not just on the features of the human face, but on the ever-changing quality and variety of digital images, as well as facial recognition technology, which is an automated form of retrieving possible facial matches from a database, not to be confused with or substituted for the manual process of facial comparison.[73]

How could AI affect FI? On the one hand, it could improve facial recognition technology, to the point of changing or in some instances supplanting the human expert's current role in facial comparison—or at least, convincing some policymakers, perhaps mistakenly, that the same activities can now be conducted just as effectively with fewer personnel. On the other, AI can and already is producing a flood of altered digital

images of faces, as well as wholly constructed facial images of people who do not, in fact, exist. Will the AI being used to discover/reveal outpace the AI used to protect/conceal? Can AI detect AI-altered or generated images? Only time will tell.■

Endnotes

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