Erowid Note:
A version of this paper was presented by Jon Hanna at the World Psychedelic Forum in Basel, Switzerland (March 2008).

International LSD Prevalence — Factors Affecting Proliferation and Control

by William Leonard Pickard

This paper is presented in memory of John Spencer Beresford, M.D., who passed away on September 2, 2007. In Basel in 2006 John—a psychiatrist and seminal researcher—presented a review of LSD prisoners and John's work with the Unjust Sentencing Project. The author of this paper, Leonard Pickard, was—and continues to be—one of the prisoners John discussed, and this paper necessarily is being presented in absentia.

John had hoped to do this presentation at Basel 2008, and communicated on its content until his death. The author, under presently very difficult conditions, wrote this paper by hand, based on personal recall and with limited references that will eventually be supplemented in web format.

The author is incarcerated for multiple life sentences for alleged LSD synthesis, in what has been described as the "the largest LSD lab seizure ever made by the Drug Enforcement Administration," discovered in 2000 in an underground, former Atlas-E nuclear missile silo in Kansas. After denying the charges, he was subjected to the longest trial in Kansas history.

At the time of the incident, the author was a researcher in public policy, particularly involving new drugs of abuse, and held appointments as a drug policy fellow at the John F. Kennedy School of Government at Harvard, and as a research associate in neurobiology at Harvard Medical School. His work did not concern LSD other than incidentally, but included three issues: 1) studies of heroin trafficking in Central Asia and Afghanistan; 2) the proliferation of clandestine laboratories in Russia and the Newly Independent States and involving such drugs as fentanyl, methcathinone and MDMA; and 3) the advent of new drugs, such as trimethylfentanyl in Russia and the use of pharmahuasca mixtures by religious groups in New Mexico and Amsterdam. More recently the author has litigated in federal court concerning DEA and FDA regulation of the proposed aphrodesic bremelanotide and related compounds.

For some years as a policy analyst, and after incarceration, the author has interviewed numerous manufacturers and distributors of illicit drugs, including heroin, cocaine, methamphetamine, fentanyl, MDMA and LSD, and the observations that follow are derived in part from those interviews as well as substantive exchanges with medical and public health researchers, forensic personnel, criminologists and other policy analysts. For legal purposes it is necessary to state that this paper is presented as a preliminary research effort to apply LSD as a model drug in addressing certain contemporary issues in these fields, and does not support or condone any illegal activity at any time.

The premise of this paper for this gathering in Basel is that while a significant and growing number of medical researchers—many of them in attendance—are looking carefully at initially a small number of subjects, there are relatively few researchers rigorously considering the large numbers of individuals in the population who have experienced LSD. Thus, in that this forum provides an opportunity to examine LSD in its uncontrolled, epidemiological context, we will explore here some of the rarely discussed factors influencing past and current worldwide LSD availability and prevalence, as well as future trends that may be anticipated. In essence, we ask: "What is the future of LSD use in non-medical settings, given its special chemical, pharmacological and psychological properties?" To answer this question we review not only

the national survey data but also the known history of LSD production and distribution for—although future trends involving heroin, cocaine and methamphetamine have been predicted in forensic settings, albeit with a large degree of error—there is little literature on factors influencing LSD availability.

With regard to the debate over medicalization versus unrestricted use, it is observed that the interest in medicalization of this compound has been driven largely by the experiences reported by the large number of illicit users themselves. While medicalization of any drug, including LSD, is a reasonable goal if unbiased, controlled studies consistently reveal that the drug may have significant medical application in a limited set of well-characterized medical or psychiatric disorders, it also has been argued that the nature of the LSD experience as reported by users cannot be contained solely within the medical paradigm, in part due to variously reported broad subjective effects characterized, for example, as religiosity, esthetics, introspection and insight. While medicalization may yet yield successful treatment for certain specific disorders, or may ultimately lead to limited government sanctioned environments in some countries where individuals without psychiatric disorders may safely experience the drug under medical or otherwise licensed supervision, the fact still remains that since 1943 only a few thousand individuals have had supervised sessions with LSD provided by government sources, whereas survey and production data suggest that hundreds of millions of individuals have had LSD from non-government sources and in medically unsupervised settings. With such a currently disproportionate ratio of subjects it is this latter population as a whole we wish to consider, for while the process of medicalization has been underway for some decades now—with incremental advances well-noted in this forum—the parallel uncontrolled and informal availability has continued for 65 years and may do so indefinitely, influenced by factors we will now discuss.

First, since effectively all LSD available to the public is illicit, and we wish to analyze the factors influencing supply in order to project the future of non-medical use, it is helpful to know both the prevalence of LSD in society and the more difficult to assess figures for the amount produced in clandestine settings. Our central question is then, "How do these percentages vary from year to year and why, and how may this data be used as a predictive tool for future trends?" Our analysis here must be guided by, and very much limited to, the standard U.S. surveys that have existed for decades describing indicators of prevalence for all drugs. Although several surveys exist, we will consider two of the most cited surveys in public health and criminological literature: the Drug Abuse Warning Network—or DAWN—and the Monitoring the Future survey—or MTF. The MTF survey title is somewhat misleading to granting agencies in that the annual results report data from four to 16 months in the past rather than anticipating future trends, and researchers are regularly surprised by new development while recording their histories of drug use reported by different age cohorts. The DAWN data focus on a wide spectrum of controlled substances and licit medications and recording, for example, emergency room visits in which the drug is noted, whether or not the drug is responsible for the visit. Federal enforcement agencies, which we will limit here to DEA and the office of National Drug Control Policy (ONDCP), rely upon these surveys to describe their concerns or successes during their annual solicitation of funds from Congressional appropriations committees, and produce public statements and charts showing the declines in prevalence or ER visits from years to year for various drugs while correlating these declines against their seizures of drugs or arrests of individuals or organizations. However, "correlation does not imply causality," that is, a decline in drug availability—in our context LSD and MDMA—cannot be correlated with any particular enforcement action. Indeed, the supply of LSD and MDMA appears to be mainly independent of such seizures, and dependent on other factors.

Thus, enforcement agencies rationalize their efforts by asserting an incapacitation effect—the removal of suppliers by arrests—and a deterrent effect, the reduction in supply due to fear of arrest. However, it is suggested that with regard to the variation in prevalence of LSD and MDMA between 1996–2006, it is a substitution effect that is a primary factor—the use of a drug other than LSD—in this instance MDMA and to a limited degree what MTF and DAWN classify as "other hallucinogens" by the same age cohorts.

The MTF data for LSD and MDMA are most interesting to compare for the period 1996–2006. Although our concern here is LSD prevalence, we discover that the appearance of MDMA in the surveys, first recorded in 1996, followed by an unprecedented and unusually steep rise—for any drug historically—suggests that this great influx of MDMA availability and use had a displacement or substitution effect on LSD use among the same cohort. LSD prevalence as observed by the MTF study, has undergone a steady decline each year since a peak in 1996. Drug policy analysts who consider these surveys also observed a remarkable and seemingly inexplicable drop in prevalence in 2001, to the lowest level of LSD availability and use seen in decades. This sudden decrease, due to then unknown factors, prompted written commentary on slate.com and other venues with articles entitled, e.g. "Where Has All the Acid Gone?"

The DEA's reply to this question, then and now, is that DEA alone was wholly responsible for the decline in LSD availability due to a single enforcement action in Kansas in 2000 entitled "Operation White Rabbit", thereafter attempting to utilize the MTF and DAWN data in asserting a 74% decline in LSD availability due to White Rabbit. Indeed, DEA's annual appropriations requests to the U.S. Congress in 2005 and 2006 were based in part on this unopposed interpretation of the MTF and DAWN data and the seizure of one clandestine laboratory. But were they correct? The DEA website shows a simple chart reflecting the DAWN data and the steady decline since 1996, but with an arrow pointing at November, 2000, the month of the Kansas seizure. There is no mention of factors causing the decline since 1996. However, a more careful review of the MTF and DAWN data suggests that the DEA interpretation was inaccurate for—it is submitted—a single laboratory or even the several laboratories seized between 1996–2000, are unlikely to strongly influence national or international prevalence figures for LSD due to the redundancy of the many labs and distributors that cumulatively are responsible for LSD availability.

In support of this observation, and conflicting with the DEA interpretation, are the following facts:

While LSD was experiencing a steady decline since 1996 and a marked decline in 2001, MDMA use had a strongly positive—almost epidemic—800% increase in the same period, thus suggesting a substitution effect. For when a new drug suddenly becomes widely available to a user population, particularly of a similar class of drugs, substitution effects are inevitable and promoted by the limits of time, cost, and interest of the user population, in this instance the 18–24 age cohort. Although the MTF explanation in its 2003 annual summary for the LSD decline in 2001 was based entirely on DEA's claim of the Kansas seizure, the MTF report in 2005—after MTF received the author's discussion of substitution effects and unpublished details of the Kansas case—began to include substitution in its theory of events in its annual report, although without attribution. In 2007, DEA continues to refer only to the earlier MTF report, neglecting to address the reality of substitution effects common to all drug use.

What were the unpublished details submitted to MTF supporting the observation that single laboratories do not significantly affect national survey results? According to government testimony, the Kansas lab was not operational in 2000 but simply stored, and was allegedly only periodically operational in Colorado and New Mexico from 1997 through July, 1999. Thus, the lab purportedly began production the year after the steady decline in availability began in 1996. Any DEA explanation based on the absence of this lab must also account for its presence. It does not. Put another way, if an agency attributes the 2001 drop to a single lab, there must also be a corresponding and significant increase in availability when the same lab begins production.

Nor, as we shall see, was there a significant rise or decline in availability from the presence or absence of any seized LSD lab between 1976 and 1996. We may begin to infer that LSD availability is not the outcome of the incapacitation of a single lab or the small cluster of loosely affiliated manufacturers—DEA suggests six—that allegedly are responsible for most LSD production, but rather the outcome of the redundancy of an unknown and much larger number of smaller, independent point sources that arise and

disappear due to several factors—other than enforcement's incapacitation and deterrent effects—that we will discuss. In sum, DEA asserts—in the case of LSD—one or a few labs can supply the international demand. It is here suggested that LSD is more similar to MDMA in that the ubiquity of such labs means the absence or presence of one or a few has no observable effect on surveys. As an extreme example of this phenomenon, the seizure of any methamphetamine "superlab"—against the background of the 6000 or so seized labs and the greater number of undetected labs—has no discernable effect on methamphetamine ER admissions.

To explore this lack of correlation between the MTF and DAWN surveys and the DEA's assertions of an incapacitation effect on labs—and further to reaffirm the lack of observable variations in availability from either the initiation or cessation of production of such labs, as opposed to the aggregate effect of multiple point sources—a brief history of the most frequently cited clandestine LSD laboratories and their estimated total production is in order. The confidence level on these estimates ranges from medium to high.

Between 1965 and 1967 the well-publicized efforts of Owsley Stanley allegedly led—in the U.S.—to the '60s phenomenon of LSD experimentation. Stanley's labs in Los Angeles (1965), Pt. Richmond, California (1966) and Denver (1967) produced a total of 400 grams, for which Stanley was sentenced to three years after his arrest in Orinda, California in December 1967, where 67 grams were seized.

In 1968–1969 the Windsor, California lab of Nick Sand and Tim Scully produced 1,100 grams in Windsor, distributed through the Brotherhood of Eternal Love as "Orange Sunshine" in 240-microgram tablets. Nick Sand was sentenced in 1974 to 15 years for his work in the 1968–9 Windsor lab and 1972 labs in St Louis and Fenton, Missouri which produced an unknown quantity of LSD (also distributed as "Orange Sunshine"). Tim Scully was sentenced in 1974 to 20 years (later reduced to 10 years), and paroled after one-third time under 1980s law for his work in the Pt Richmond, Denver and the Windsor labs. While Scully was released after serving 3-1/3 years due to community service and support, Nick Sand departed to Canada and continued his efforts.

In 1968–1970 the Paris and Orleans labs of Ron Stark and Tord Svenson purportedly produced several kilograms of LSD and from 1971–1972 their Belgian laboratory reportedly produced another several kilos, all distributed via the Brotherhood of Eternal Love as "Orange Sunshine." Stark eventually was arrested in Italy in 1975, where he served four years. He was arrested and deported in 1983 from Holland to the US where he faced conspiracy charges, in US v Sand and Scully et al. in San Francisco, but the charges were eventually dropped in 1983. He died in San Francisco in 1984 from a heart attack.

In 1975 the MTF survey began collecting data, while DAWN began collecting data in 1994.

In the mid-late 1970s in the UK, the "Operation Julie" group of Richard Kemp, Henry Todd, David Solomon, Andy Munro, et al. produced several kilograms. In March 1977 British agents in Operation Julie arrested over 100 suspects, with the latter receiving sentences ranging as high as 13 years.

During the period 1970–1980 in various locations the manufacturing chemists Bill Weeks and associates are alleged to have produced several kilograms, as did Tord Svenson from 1974–1990 in locations in Europe, Arizona and New Mexico.

The Clearlight system allegedly began small scale production in Santa Cruz in 1968, moving on to larger scale production in San Francisco in the early 1970s, reportedly producing more than a kilo. In the 1980s the Clearlight group of Denis Kelly in Burnt Ridge, Oregon began producing the gelatin form of LSD known as "Windowpane." Several individuals were sentenced to ten years, with Kelly eventually surrendering after negotiating a sentence of two years.

In the 1980s several major German labs began production, although details on these sites are lacking. Those with information on these labs or other labs not mentioned in this time frame are invited to contact the author.

In 1988 in Mountain View, California a lab attributed to the author was seized along with 34 grams, and for which the maximum state sentence of five years was served. No production figures were estimated by state or federal authorities.

In 1996 in Port Coquitlam, British Columbia near Vancouver, Nick Sand was arrested, after 20 years as a fugitive, with a lab and 43 grams. While the lab was described by Canadian authorities as the major supplier of LSD, the production figures are estimated to be about one kilogram. For both the 1969 Windsor lab and the 1996 Vancouver lab, Nick Sand served a total of five years. There was no precipitous decline in 1996, however, rather a long, steady decline even as the Kansas lab purportedly began production from 1997 through July, 1999.

In 2000 in Kansas the DEA announced the seizure of 50 kilograms of LSD and a lab alleged to be the author's, with this figure consistently through the current date reported in DEA websites, Congressional hearings, and even appellate decisions. However, at sentencing in 2004 the DEA technician stated that the 50 kilograms were solvents later discarded by the author, and DEA analysis of this discarded material yielded less than 196 grams of unusable LSD that was actually seized. The total production of this lab remains unknown. Six kilograms of ergot alkaloid was seized, and months after the incident the primary informant was discovered to have—as government testimony characterized it—"stolen" an additional twelve kilograms of alkaloid prior to directing enforcement agencies to the lab, with this material later seized from the informant in 2001.

Interestingly, at trial—in an effort to explain the lack of an increase in availability during the time the lab allegedly was operating—the government asserted the LSD itself was distributed in Europe rather than the U.S., conflicting with its later assertions to Congress. Indeed, from observing the MTF/DAWN data from 1976–2006, it may be observed that no lab whose seizure was described in the media has had any effect on survey results while beginning production and, arguably, while ceasing production. Since only a few labs have been seized, most are described in the media as the "largest", while actual production figures are usually unavailable.

By comparison, the many existing small labs are less easily detected, easier to move, and of shorter duration in productivity, yet their aggregate output from many point sources creates the baseline availability of LSD. We may consider the 2004 case of Casey Hardison in the U.K. as an example, for this lab was small enough to fit into a bedroom, producing limited quantities of 2C-B (1Kg) and DMT (75g), and with nine grams of LSD later seized, although prosecution argued that at total of 188g had been produced calling it the most complex illicit laboratory since Kemp in 1977. Although arguing on appeal for a reduced sentence based on quantity and citing the Kansas lab to demonstrate the disproportionate production to the court, Hardison nevertheless was sentenced to 20 years. However, under U.K. law, he is eligible for parole in half the time, and will be released from HMP Ford in as little as four years and six months at the time of writing. He invites correspondence from researchers and other interested parties.

In additional support of the proposal that the U.S. and international availability of LSD arises primarily from the cumulative output of numerous small labs—somewhat similar to the lack of variability in survey results of MDMA availability even after seizures of major MDMA labs, we may note the price structure data in Europe and the U.K., where prices have shown little variability for decades, and cannot be correlated with any single lab seizure.

If, then, incapacitation effects on availability from the occasional lab seizure are minimal or nonexistent, what is the deterrent effect from fear of arrest by manufacturers and distributors? More specifically, what are the other deterrent factors—not only fear of arrest—that limit manufacture? What are the constraints on any one site's productivity? What is the effect of precursor control programs on such sites, and what factors limit or enhance the proliferation of multiple sources? In sum, what are the factors that—now and in the future—contract or expand the availability of LSD, excluding demand, price and public perception of effects? Examining the intrinsic factors affecting manufacture, the author's interviews have indicated several of particular consequence. The intrinsic factors include the physical properties of the clandestine lab itself, the psychological effects particular to the drug itself, and the covert-lifestyle required of suppliers. The extrinsic factors include the precursor control programs in effect by various governments; and improvements in enforcement methodologies directed at drug control or any criminalized activity.

Factors that expand availability include the opposing psychological and physical properties particular to the drug itself and resulting in multiple point sources, and advances in synthetic procedures specifically adapted to clandestine environments. While reasserting the author's caveat on illicit endeavor, each of these factors will be briefly discussed, focusing on enforcement strategies that successfully contract all drug availability.

The most widely recognized constraints on aggregate clandestine lab production—thus availability observed by MTF and DAWN—include the limited incapacitation and deterrent effects from the obvious legal controls in the U.S., and the onerous mandatory minimum sentences based on the number of doses, the weight in grams, and prior felony convictions of any nature. These are among the most severe penalties internationally, although the rational basis for such sentencing relative to more problematic drugs remains unclear. For example, in 2005 DAWN indicated that emergency room visits for LSD—generally for temporary disorientation and anxiety among first-time users—was only one four-hundredth of the number of visits involving cocaine, the latter with its known addictive properties and lethality. Specifically, there were 1,864 LSD visits versus 816,691 cocaine visits, and with the cocaine visits strongly disproportionate for severity of medical problems. In Congressional testimony on July 25, 2000 a DEA official admitted, "Most users of LSD voluntarily decrease or stop using it over time, since it does not produce the same compulsive, drug-induced behavior of cocaine and heroin."

Similarly, LSD use is not criminogenic in the sense of associated criminal activity such as violence and theft, which frequently accompany use of stimulants and narcotics. Thus, while allocation of substantial enforcement resources appears to be misapplied with regard to the relatively minor social problems associated with LSD use, U.S. penalties often continue to be described—for all drugs—as "draconian".

For example, among LSD prisoners in the U.S. one physically disabled, chair-bound 35-year-old father of two—Roderick Walker—is serving a life sentence for 500 doses of LSD. While it is conceded that such severe controls have a limited deterrent effect in reducing LSD distribution, it is proposed that the aggregate cost to society from such lengthy imprisonment outweighs the putative social benefit from the reduction in use. Keeping Roderick Walker alone imprisoned for life will cost almost three million dollars—for 500 doses—funds that could produce a greater deterrent effect or result in greater benefit if applied to social programs and education.

Other than the deterrent effect of severe penalties, what are other generally unreported factors that result in the contraction of the general drug supply or which apply only to LSD? To answer this question the author, as a policy analyst, has conducted interviews in the community and in prison settings of numerous drug manufacturers and distributors of methamphetamine, heroin, cocaine, PCP, fentanyl, MDMA and LSD. We will limit this discussion to LSD, and consider certain rarely addressed special characteristics of clandestine labs that influence availability.

Of course, location and size of clandestine labs determine in part total productivity per year. Labs frequently tend to be rural, with sites found in remote desert or mountain environments, although there are exceptions such as the 1967 and 1968 Denver labs and the St Louis, Belgian and Paris labs in the 1970s discussed earlier. This remoteness, while reducing the probability of detection by enforcement agencies, also makes access to the site more difficult and requires lengthy periods of social isolation for the manufacturer. Isolation also reduces productivity due to lack of ready access to supplies of chemicals and equipment. Another rarely addressed factor limiting clandestine production is the unusual potency of LSD. In that specialized devices such as efficient fume hoods, anaerobic conditions, and full protective clothing with face shields and breathing apparatus are less effective or nonexistent in clandestine environments—particularly in larger labs—manufacturers have difficulty during the synthesis in preventing constant exposure to large quantities of LSD and are frequently subjected to incidental doses of 50 micrograms to many milligrams of LSD each day. LSD is absorbed through skin contact with LSD-containing solvents, through inhalation of dried particulate forms of LSD, and through ocular solution. This incidental exposure to unknown quantities of LSD as chronic and acute doses over weeks and months—together with the anxiety from fear of detection and arrest and the sense of dissociation from conducting a covert-lifestyle—all result in psychological stresses beyond that of a simple low-level LSD experience. The exposure effects are generally proportional to the size of the lab, with smaller labs having greater control over incidental LSD. Although manufacturing chemists are routinely exposed to LSD for protracted periods, a protective effect has been noted in what has been described as "saturation", wherein rapid tolerance to the drug is built up in the first few days of exposure, after which the subjective experience in terms of peak effects are significantly lessened. Nevertheless, except for periodic breaks, production tends to continue through a series of batch syntheses for indefinite periods—sometimes years—until either an arrest occurs in the distribution network or of the manufacturer, or otherwise until a personal decision is made to cease activity, or there is a temporary or permanent interruption in the supply of precursors or other requirements.

Exposure effects with other drugs, most notably the synthetic morphine substitute fentanyl, have been observed and provide an interesting example. While fentanyl exposure can be lethal, and LSD is not, and fentanyl production is much rarer than LSD, both are effective at about 100 micrograms. In the U.S. in the 1980s fentanyl suddenly appeared among heroin users in California—resulting in over 100 deaths—then suddenly disappeared, with the absence of fentanyl attributed to the death of the manufacturer from inadvertent contact.

If our premise is correct that LSD supply is redundant—having a larger number of point sources—and incapacitation appears not to affect availability, what are the other factors limiting supply? Certainly, other constraints on production of all drugs include successful enforcement efforts that control specialized lab apparatus and—particularly—reagent chemicals and essential precursors. In the case of LSD it is this last factor—precursor control—that merits further discussion. Since 2000, interviews by the author with manufacturers, and review of court transcripts wherein DEA technicians have publicly and explicitly described details of various LSD syntheses, indicate that clandestine production is rarely if ever achieved by using published procedures or patents involving Claviceps purpurea, Claviceps paspali and other fungi, even in submerged culture, nor are biotech methods employed in clandestine situations. Instead, effectively all LSD is synthesized by the initial hydrolysis of ergotamine tartrate (ET) or other ergot alkaloids to lysergic acid, thereafter to the diethylamide. The licit world pharmaceutical production of ET from source countries is about 15,000 kilograms annually, with ET subject to strict precursor controls since the early 1990s in most countries—which may be a major factor in the decline since 1996—but with fewer or less effective controls in the third world. Since the advent of Sumatriptan and other remedies for migraine headaches, the world demand for this purpose has declined, although offset by the increase in population.

This synthetic bottleneck, the dependency on ET supply, may be the most important single factor affecting proliferation of clandestine laboratory sites—excluding the synthetic hurdles themselves—and this

effect on worldwide availability has been successfully exploited by enforcement agencies that nonetheless prefer to assign decreases in availability to more newsworthy arrests. In the unlikely event a practical alternative synthesis of the lysergic acid moiety is eventually invented, prevalence of LSD may be decoupled from the requirement for ET and increases in availability will be observed due to the increase in point sources, or numerous small labs. A dramatic example of ubiquitous alternative sources arising from attempts at control may be seen in enforcement agencies' efforts in the 1980s to suppress methamphetamine labs. After observing a similar synthetic bottleneck involving phenyl-2-propanone or P-2-P, the synthetic precursor of choice for methamphetamine and available in large quantities only from a limited number of chemical firms, agencies criminalized unlicensed possession of P-2-P, forcing illicit methamphetamine manufacturers to seek other synthetic methods using uncontrolled precursors. They arrived at a simple process requiring little or no equipment and using the cheap, plant-based precursor ephedrine, available worldwide from thousands of sources. The result was an unanticipated and explosive increase in point sources of methamphetamine, with thousands of labs seized annually in the U.S. alone, and the abuse of methamphetamine became observed even in rural areas and among previously naive populations.

Precursor control programs, while effective in reduction of the supply of synthetic drugs, are somewhat undermined by the increasing internet availability of chemicals and laboratory apparatus, the advent of simplified synthetic procedures on the net, and the resale of chemicals through the industrial recycling firms. LSD prevalence alone remains directly proportional to precursor availability, with no alternate sources of ET or lysergic acid. The author's interviews at the Precursor Control Unit of the UN Drug Control Program in Vienna in 1996 indicated that precursors or requisite chemicals for all illicit drugs – and particularly heroin, cocaine, methamphetamine and MDMA—may be diverted along the routes of shipment from the source countries to the end user, particularly in free-trade zones or during transshipment through multiple countries, then relabeled and shipped to illicit organizations. Although the UN program is successful in many instances, the relative rarity and comparatively small bulk of illicit ET shipments—perhaps less than 100 kilograms worldwide annually—in contrast to the thousands of tons of reagents for heroin and cocaine, suggest that efforts to prevent diversion of ET may not be cost-effective with regard to its relative social consequence.

Proliferation or constraints on LSD availability also relate to either synthetic problems or advances in the art. The early major labs, e.g. those of the Brotherhood of Eternal Love in America and abroad, used the "Garbrecht method"—by more recent technologies a difficult and unwieldy but effective procedure—using the noxious reagent sulfur trioxide and requiring the recycling of the significant quantity of the reaction byproduct iso-LSD to achieve higher yields. In the 1980s methods using peptide-linking reagents such as carbodiimidazole became widely used, with significant increases in yield. More recent advances discussed by DEA technicians in public proceedings and thereby potentially influencing availability involve the use of reagents that result in a one-step reaction producing LSD that does not require column chromatography to remove the very minimal iso-LSD byproduct, and that may be subject to standard bench methods to achieve higher purity. Thus, yields of LSD that are now practically achievable reportedly approach the theoretical limit for conversion of lysergic acid to LSD.

And what of the future, synthetically? For decades, most LSD has been produced in clandestine labs in large glass reactors, hydrolyzing as much as one kilogram of ET at once, followed by weeks of further reactions and purification processes, all while the manufacturing chemist is exposed to the effects of LSD. Any single site at this level is estimated to produce less than a few kilograms annually, as noted earlier in the various lab seizures since the 1960s. However, in recent trials government witnesses described the appearance of new technologies that may be employed by more sophisticated organizations that reduce or eliminate the exposure problem while automating the synthesis into a scalable pilot plant or industrial procedure.

In that, for LSD, a pilot process would produce in excess of ten kilograms per year, the advent of microreactors in the pharmaceutical industry must be addressed. A bank of microreactors is a fully automated, computer controlled, tabletop-size machine that produces a few milligrams of a substance with each cycle, perhaps employing the same reagents and syntheses previously discussed, although on a very small scale. However, this cycling of a bank of microreactors producing a few milligrams is repeated indefinitely with hundreds of small reactions by each microreactor daily, yielding, for example, 10–30 grams of product each day. For the pharmaceutical industry, microreactor arrays have produced hundreds of kilograms each year of highly specialized pharmaceuticals that are otherwise difficult to synthesize or problematic due to exposure of workers to toxic effects. This technology—while requiring highly skilled individuals and having significant costs of entry—is easily adapted to current syntheses for LSD and may result in the first automatic process for its production, with routine bench procedures being relegated to smaller, conventional labs.

And what may be the future for the LSD molecular structure itself, a compound heavily researched for 65 years for potential medical applications, yet subject to severe criminalization throughout the world? LSD has a de facto status similar to that of morphine or cocaine, i.e. an old drug with medical application but significant uncontrolled use, and no efficacious substitute. Similar to morphine, there is no replacement for the special properties of LSD, no analogue or derivative of the ergolene structure that has substituted directly for it either in licit research or in general availability. Certainly, the private organizations that provide research grants do so almost exclusively to medical researchers and not post-doctoral medicinal chemists, and this oversight means that creative research on new variants is quiescent. Yet, many researchers have suggested that structures be developed that may reduce the duration of effects from ten hours to a more medically manageable few hours, or to ameliorate the dissociative or anxiety-inducing effects, thus improving the potential for medical use, and at the same time a second generation structure might yield significant substitution effects and reduce the incidence of complications in uncontrolled use. Similar arguments may be made for reducing the toxic properties of MDMA. Yet these developments must await funding organizations' awareness that medical application of any drug is ultimately driven by the underlying advances in medicinal chemistry as, indeed, this conference is the outcome of a search for structural variants in 1943.

But what countervailing and increasingly pervasive and sophisticated enforcement technologies—applicable to all illicit drugs—oppose these developments and tend to contract availability, or that affect all criminalized activity? We will first address methods developed in the last 30 years, and computerized since the mid-1990s, that specifically influence all drug prevalence internationally. This analysis is derived from entirely open source, publicly available records, including various transcripts of trial and appeals, and is provided for public health and forensic research purposes only as one factor influencing drug availability, and is not intended to assist individuals in illicit endeavors.

While investigative methods applied to any crime generate reports of investigation for data banks—including those already known to the public and routinely described in the media—some are increasingly effective in reducing crime by employing specialized technologies earlier utilized by intelligence agencies concerned with more serious national security and foreign intelligence matters. Indeed, civil libertarians have raised concerns about the application of data banks and data mining in the post -9/11 era—arising from the Department of Defense's software programs known as TIPSTER—to civilian matters involving nonviolent drug use and other victimless crimes. Because drug use, drug distribution, and drug manufacture are in themselves essentially private transactions between consenting parties—as opposed to public violent crimes—enforcement agencies must use more intrusive methods to obtain arrests, and these intrusions may involve arguably extra-Constitutional actions not infrequently unreported and overlooked by the courts. Some of these generally known methods include the use of specialized surveillance techniques and the use of informants. Surveillance includes visual surveillance of people and locations using, e.g.

plainclothes individuals or teams, frequently in radio contact with multiple vehicles or aircraft, as well as placement of transmitting devices on vehicles or in deliveries to track people or shipments to their ultimate destinations, for example, rural laboratories. The requirement for tracking devices has been lessened with the arrival of anti-theft and positioning systems already installed in new vehicles. Other routine surveillance methods known to the public include analysis of credit card information and telephone records to identify the time and place of events, themselves subject to routine and retrievable video surveillance by security cameras that are ubiquitous in commercial or urban locations. Traffic analysis is employed on local and long distance telephone records, including records of incoming as well as outgoing phone calls—both maintained by phone companies although the former do not appear on personal billing statements—and records are kept of incoming and outgoing calls, even of paging devices, public phone booths, prepaid cell phones, and other wireless devices, as well as emails indefinitely maintained by internet service providers. The records can then be subjected to traffic analysis to develop association trees identifying the subscriber who placed or received the calls, even years after the event, and with subscriber names being checked for criminal history or suspected activity against large investigative databases.

Thus national and international criminal conspiracies may be identified and characterized by determining who called whom and when, with the data analyzed in support of continuing investigation and eventually submitted as evidence in criminal prosecutions. Of course, the use of wiretaps and eavesdropping devices to record private conversation, or court-ordered surreptitious video cameras—even in the home if required—are well-known, as may be covert or anticipatory warrants whereby—lacking evidence of a crime—police are permitted to covertly search businesses or residences looking for evidence of crime, but without thereafter notifying the subject or owner. The use of "trash pulls" is frequent, whereby unwitting residents' garbage is searched and returned after filtering out phone bills, credit card receipts, handwritten numbers, names and addresses, or indicators of drug use. An expansion of this practice in the U.S. is now well-established in wide geographic areas of problematic drug activity called HIDTA regions or High-Intensity Drug Trafficking Areas, such as the border states or air-entry points for cocaine trafficking, or the Midwest's ongoing rural methamphetamine epidemic. In HIDTA regions, now including most large metropolitan areas, the program known as "Pocket-Trash" is in effect, whereby local seizures or routine traffic stops involving one pound or more of heroin, cocaine, methamphetamine—or 500 doses of LSD—are subject to careful scrutiny of scrap paper with phone numbers, names, addresses, rental and storage receipts, and cell phone or pager incoming and outgoing contact histories, and other records.

All records are then forwarded to DEA for uploading into their database called NADDIS, the Narcotic and Dangerous Drug Information system, and the records and associated reports are then available online to any DEA investigator.

As the media rely upon for many crime dramas, confidential informants are historically—and remain—the primary source of almost all drug arrests. These are usually individuals who have been arrested or merely threatened with arrest, who then in exchange for reduced charges or sentences or non-prosecution agreements provide substantial assistance to the government in the prosecution of others. Informants are subjected to numerous interviews, appear before grand juries, and act as witnesses at trials. Under the mandatory Attorney Generals' Guidelines of 2001–2002, "cooperating witnesses may also be considered informants, but not individuals classified as "sources of information" or SOIs—those not associated with criminal activity, but who provide information as a result of their employment or occupation. E.g., bank tellers and hotel clerks. Other individuals extant to these classifications include those with routine contact with federal agencies for research purposes, including forensic scientists, criminologists, public health and medical researchers, public and private funding organizations, and drug policy analysts. Actual confidential informants customarily conduct "controlled calls" in an effort to implicate third parties, whereafter the recording may be used as evidence in court, or they may meet with third parties while wearing small concealed digital devices to record drug buys or conspiratorial conversations. The primary factor in the

arrest of most individuals and the dismantling of drug trafficking organizations remains the pervasive and increasing use of informants and cooperating witnesses. While informants may be necessary in some instances to penetrate and compromise large, violent and criminogenic international heroin and cocaine cartels, civil libertarians have expressed concerns that the ultimate social costs from such intrusive methods may outweigh the benefits, and that the need for this extreme of intrusion in nonviolent crime—balanced against the attrition of our personal liberties and privacy interests—is less clear.

But how are surveillance reports, toll record analyses, witness interviews, use of informants, and other information integrated into a coherent investigative database that can be employed to compromise criminal organizations or reduce general drug availability through incapacitation effects? With regard to DEA, the answer is its NADDIS database and, indeed, public knowledge of NADDIS arguably may in itself have a deterrent effect. Although NADDIS is the most widely used tool in drug law enforcement, and inquiry to NADDIS about an individual is commonly the first step in any investigation, public information on NADDIS is so infrequent that even the 7th Circuit Court of Appeals in the U.S., ultimately ruling on thousands of drug cases each year in which NADDIS was regularly employed, has stated, "It would be nice to know something about NADDIS."

The author's review of the scanty secondary literature has revealed—other than limited mention in appellate decisions—certain characteristics of this database, however. Operated by DEA's Records Management Section, or SARI, possibly an acronym for "Software Agents for Retrieval of Information", NADDIS is now automated in part using the Defense Advanced Research Project Agency's TIPSTER program for a text processing of reports of investigation from DEA field offices, and has—since its inception in the 1970s—developed files on over eight million individuals, organizations, and other "subjects of interest" to DEA. A single file on an individual may contain names, addresses, phone numbers, reports of investigations over decades, personal histories, analysts' data, and other records, with over 40,000 new reports added to NADDIS each month in 2007 from the U.S. field offices and from the over 50 international DEA offices. A NADDIS inquiry on members of the Colombian congress indicated that more than one-quarter had NADDIS records. How is an individual's NADDIS file initiated? If a person's name is mentioned by an informant or a witness in an interview by DEA agents, it is entered into an index of names in a report of investigation, known as a "DEA-6"—to be prepared from witness or informant interviews, copies of which are sent to the 100 analysts working in two shifts at the DEA SARI section—where the analysts read the report and retype abstracts of the most salient data, check the names against existing NADDIS files and either cross-reference the abstract against multiple individuals' files or open a new NADDIS file on a previously unknown individual, and with the abstracts finally entered in chronological order into the NADDIS summary or index, an abbreviated collection of abstracts that becomes a quick reference for an investigator on all that is known by DEA on an individual, an address, a business, or a phone number. The NADDIS index then becomes the practical means for locating the full reports for more detailed review, with the NADDIS index pointing to the complete reports and the agents that created them, permitting multiple investigations from different regions on the same person not to conflict, and to allow national and international investigations to be quickly established. With 40,000 reports being filed each month to the existing database of over 8,000,000 people, and DEA's implementation of automated procedures evolving from the Department of Defense TIPSTER program for document processing, the increasing efficiency of this and other similar databases may also be one factor in greater incapacitation effects and the reduction of both drug crimes and all crimes in general since 1996.

Yet, to civil libertarians, defense attorneys, and courts concerned with ethics in government, the NADDIS database provides a historical archive of the chronology of events and actions that may be of great value in monitoring the integrity of government investigations and organizations for possible impropriety. For example, not infrequently prosecutors and agents may be reluctant to disclose at trial events or criminal investigative histories of cooperating witnesses or informants that may be useful to the court, the jury, and

defense counsel in weighing the credibility of informants or—for that matter—the agents themselves. In the U.S. the investigative history of a witness is required to be produced, and this would of course include the witness' entire NADDIS index from its inception and all reports from which it is abstracted. Yet, the NADDIS index is almost never produced, even if specifically requested. While prosecutors and agents can select what reports they wish to provide the defense, the NADDIS index itself cannot be altered except by court order, and contains a permanent record of a witness' entire history. In the Kansas trial in 2003, for example, the informant was portrayed as having previously been an informant in "only one instance", in an earlier state case. By 2007, the defense determined that the individual had been a career informant—and a problematic one—for multiple agencies for decades, a matter now the subject of an ongoing appeal. Had the NADDIS record been produced, and it is still being withheld in that case, the problematic and extensive criminal and informant history of the witness would have been available to the court and jury at trial.

In that suppression of Constitutionally-mandated evidence is regularly encountered in prosecutions, the author—by way of civil and criminal litigation in California and Kansas, respectively—is now examining the structure of the NADDIS reporting system to clarify the Constitutional requirement for its production in criminal trials, and this matter is the topic of a forthcoming paper on NADDIS. However, any U.S. citizen may request a copy of his NADDIS record by submitting a Freedom of Information Act request to DEA, with many countries having a variation of this request for its citizens and databases. While the results are heavily censored, or redacted, and these redactions may be challenged by a civil procedure in federal court in a very lengthy process, the mere existence and extent of one's NADDIS file may prove of some personal interest.

Clearly, advances in enforcement methods oppose the increase in availability of any controlled substance, including those with special characteristics such as LSD. What then may we predict for the future of LSD use? Will it continue its stable, long-term trends, expand in availability, or diminish to an increasingly limited user cohort?

We have considered the several influences that reduce supply, among them the incapacitation and deterrent effects of severe legal penalties and international control regimes, the application of precursor controls and the paradoxical outcomes of precursor controls such as these on methamphetamine supply and the increase in point sources therefrom, the advent and progression of specialized investigative methods, the automation of large investigative databases, the concerns of civil libertarians about such domestic intelligence gathering databases applied to lesser crimes, the limitations on LSD manufacture due to saturation and isolation, the substitution effects of MDMA and other hallucinogens as characterized by DAWN, the overemphasis on arrests by enforcement agencies as the primary factor in reducing availability, the general reduction in all drug availability and all drug and non-drug crime since 1996, and the deterrent effects of several factors on the user population.

Balanced against and opposing these contracting factors are influences that tend to expand general drug availability, and with reference to the special properties of LSD, we have also considered the existence of many small, portable, less easily detected labs as the aggregate basis of availability, the unlikelihood of any one lab contributing significantly to variances in U.S. or international survey data, the absence of any increase in availability due to the initiation of production by any single lab, the small dosage of LSD as a factor increasing local supply from a single point source yet with such single sources inadequate to affect national survey data in similarity to MDMA and methamphetamine labs, the failure of precursor control programs with regard to LSD due to the compactness of its precursor and the large number of legitimate end-users in over 170 countries among which diversion may occur, the availability of apparatus and reagents on the internet and through industrial recyclers, the advances in simplified, high-yield bench methods of synthesis and the possible application of automated microreactors. Some factors remain upon

which we have not elaborated, such as organizational bonding due to shared drug experiences described by users as "spiritual", the influence of such religiosity upon manufacture, distribution or use, and the initiation of new LSD users as a type of "reverse substitution" from first-time participation in MDMA use.

In this limited time we have discussed only a few of the many factors commonly recognized by criminologists and public health researchers, while introducing factors less frequently addressed. With so many confounding and conflicting influences, the future of LSD availability is not easily predicted.

Attempting predictions based on short-term, year-to-year survey results is futile. For example, drug enforcement officials have asserted at different times, based on the 2003 DAWN results, a 74% drop in availability, a 95% drop, or describing LSD availability as "wiped out". However, using such non-rigorous procedures and the DAWN database, a counterclaim of a 200% increase in availability from 2003-2006 may also be asserted, in either event requiring additional funding for federal agencies.

A less biased approach would be to consider that all of the factors we have discussed have existed in one form or the other for the 40 years in which LSD has been widely available. However, the survey data since 1976 shows only moderate variations within a narrow range relative to drugs of greater abuse potential, and a somewhat greater variation in 2001 due to substitution effects of the unanticipated peak use of MDMA.

In conclusion, what is the future of uncontrolled LSD availability, excluding increases arising from public perception of any benefits reported by researchers in the medicalization effort?

While observing that the contracting factors we have discussed are not subject to rapid change, it is submitted that LSD availability—absent a synthetic advance or positive substitution effect from an LSD analog or a negative substitution effect from a new MDMA variant or other future drug—will continue in the moderate long-term trend range recorded over the last three decades, with slow increases and decreases over a period of years, and with about 10% of the population having experienced LSD over a lifetime.

Finally, any strongly significant change in availability will await the arrival of a new drug, whether a preferred short-duration LSD variant or another psychedelic-entheogen-entactogen or—it may be ventured—the substitution effect of an entirely different class of compounds, e.g. structures under development that affect libido, such as a safer version of bremelanotide or other melanocortin agonist, or new drugs for the enhancement of learning and memory, such as experimental compounds in the ampakine series, for example, CX-717. Barring these unusual developments, LSD itself may well never be subject to strong substitution effects, given its special properties and characteristics, may be expected to retain its place in the pharmacopoeia as both a historical and a future drug.

In closing, the author wishes to acknowledge Drs. John Beresford, Lester Grinspoon and Sasha Shulgin, as well as Ann Shulgin, for their encouragement and support. The unfailing effort of Dr. Tim Scully is appreciated for historical and production data, and researchers will find his ongoing scholarly history of LSD laboratories a valuable resource. My thanks also to the presenter for his quick mastery of arcane terms, to graduate students Ben Denio and Michael Golden, to attorney Billy Rork, to my family and children in their faith and hope, and to the unnamed researchers and friends whose courage and kindness in these difficult years remains forever in my memory.

In that this presentation is a working paper and subject to continuing revision in web format, any questions, suggestions and contributions of information are strongly encouraged, and the author may be contacted at the website www.freepickard.org or at aphrodine.1 << at >> gmail.com.

Survey information in countries other than the U.S. is requested, as are any details on the topics discussed today.

And to the audience, particularly those who remained undeterred throughout this presentation, thank you for listening.