

A Psychedelic Neurochemistry of Time

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In 1958, Rollo May observed “the most profound psychological experiences are peculiarly those which shake the individual’s relation to time” (p.68). An accumulating literature suggests that a wide array of psychedelics can induce potent changes in time perception (Baruss & Vletas, 2003; Dawson, 2001; Hayes, 2000; Melges, Tinklenberg, Hollister, & Gillespie, 1970; Shanon, 2001; Strassman, 2001). For example, as Strassman (2001) writes of DMT:

Past, present, and future merge together into a timeless moment, the now of eternity. Time stops, inasmuch as it no longer “passes.” There is existence, but it is not dependent upon time. Now and then, before and after, all combine into this exact point. On the relative level, short periods of time encompass enormous amounts of experience (p. 234).

Very little is known about the nature of these changes. However, the repeated theme of temporal distortion amongst many archives of psychedelic experiences (e.g., Hayes, 2000; Siebert, 2004; Strassman, 2001) strongly supports the notion that psychedelic drugs do, in some way, impact the underlying neurochemistry of time perception.

Describing an experience with the psychedelic plant *Salvia Divinorum*, Daniel Siebert (2004) writes:

The last words to pass through my head went something like, “Just as I thought. This stuff is inactive. I’ll go toss it in the trash.” Then quite suddenly I found myself in a confused, fast moving state of consciousness with absolutely no idea where my body or my universe had gone. I have little memory of this initial period of the experience, but I do know that a lot was happening and that it seemed quite literally like an eternity, when in fact it must only have lasted a few minutes . . . In this state, all the points of time in my personal history coexisted. One did not precede the next. Apparently, had I so willed it, I could return to any point in my life and really be there, because it was actually happening right now.

These experiences raise questions regarding the very nature of existence and of the mental universe. Since the work of Einstein, distortions of the fabric of space-time have been commonplace in discussions of the speed of light, relativity, and cosmology. Likewise, subjective accounts of psychedelic experiences often include perceptual distortions that include insights about cosmological questions like “What was God doing before the beginning?”, “How did the universe begin?”, and “What is the nature of time?”

There are few illustrations of the astronomical-psychedelic link as specific as the following recent report of viewing a total lunar eclipse after consuming LSD (Dawson, 2001):

As the eclipse became total, with the sun behind us as we viewed the moon in front of us, only a point of light remained on the moon. Completely without warning, the bright rays of light from this point seemed to attach to my head, lift it off my shoulders, and physically move it . . . to the edge of the moon where I was given a clear view of the entire Milky Way extending outward from my head! It seemed to flow through my head at the level of my eyes.

Consistent with the astronomical associations of such experiences, an astrophysicist has recently proposed that models used in astronomy and mathematics can also be used to better understand the non-ordinary mental time of psychedelic experience (Saniga & Buccheri, 2003). Metod Saniga (from the Slovak Academy of Sciences) employs advanced concepts that link algebra and geometry, like projective spaces and so-called Cremona transformations that appear in chaos theory. In providing a workable mathematical model of subjective experience, Saniga raises mental experience to a par with physical reality. As Siebert (2004) writes:

I had the sudden realization that although I had

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managed to pull myself back into my body I had somehow ended up back in the wrong spot in the timeline of my physical existence. I was convinced that I might be stuck in this situation and would have to continue my life from this point in my past.

Certainly, a useful set of new studies of psychedelic experiences would explore and evaluate the mathematical modelling of archived experiences of psychedelic and other non-ordinary mental times. This set of studies would hopefully shed light on the way that time binds and unifies conscious experience and how it is “un-bound” by psychedelics (Dawson, 2004).

To return to the words of Rollo May (1958, p. 68):

Severe anxiety and depression blot out time, annihilate the future. Or, as Minkowski proposes, it may be that the disturbance of the patient in relation to time, his inability to “have a future, gives rise to his anxiety and depression.” In either case, the most painful aspect of the sufferer’s predicament is that he is unable to imagine a future moment in time when he will be out of the anxiety or depression.

The association between perceptual time distortion and psychedelic experience also points to the usefulness of studies of existential crisis. The person in existential crisis cannot even answer the question of whether they exist in a “time” that other people have in common. As concerns emerge about harmful side-effects of traditional antidepressants (Health Canada, 2004; US FDA, 2004), case studies have recently appeared suggesting Salvia Divinorum may have antidepressant properties (Halpern, 2003; Hanes, 2001/2003).

Moreover, psychedelics may specifically activate an endogenous neurochemical system that regulates time perception (Dawson, 2004). If this is the case, and there is certainly ample evidence to suggest it is (e.g., Baruss & Vletas, 2003; Dawson, 2001; Hayes, 2000; Melges, Tinklenberg, Hollister, & Gillespie, 1970; Shanon, 2001; Strassman, 2001), the study of this temporal neurochemical system is critical. Phenomena such as aging, mental illness, and drug-induced changes in time perception may all have this system in common (Dawson, 2004). Because psychedelics seem to tap quickly and directly into this system, they may be one of the most suitable technologies for its study.

However, the risks of a one-way trip through time are important to acknowledge and raise the need to adequately prepare inexperienced travellers for the totally alien times they may discover. As Ornstein (1979) writes:

Very often this experience cannot be placed in linear coordinates, for it is outside this mode of operation, outside

words, outside normal time. The best the verbal-logical mode can do to account for the experiences is to term them “timeless” . . . which allow for “an infinite present” to exist. These experiences, for many, represent the first significant break from a normal linear consciousness, normal reality, and normal time. For some, the break into a new area of experience is unsupported by the remainder of their lives and their training, and they may not be able to return to normal consciousness (p. 89).

The phenomenological and empirical research suggests a clear association between the activity of the brain and the suspension of linear time and perceived cause-effect relationships by psychedelic and entheogenic substances. Cannabinoid, serotonin, dopamine, and opiate receptor systems are associated with altering time consciousness and included in a neurochemical system that regulates the perception of time. Consciousness of time is as critical as the very sense of self, identity, or being, and to the sense that there is any meaning to life at all. Psychedelic neurochemistry highlights the temporal boundary between our perception of “who I am” and “who I am not.” This perspective leads to an exploration of boundary conditions: between self and other, between medications and street-drugs, and between mental health and mental illness.

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Extending Strassman’s (2001) proposal, it is suggested here that time and the way it is regulated neurochemically is responsible for the perception of interpersonal boundaries. These boundaries include age, gender, family relationships across generations, the boundary between life and death, and time pressure (or sense of being busy). When these boundaries are transcended with the use of psychedelics, we encounter fusion of self with other. It is here that one person’s consciousness may become temporally located at overlapping levels of reality. Rather than perspectives “missing each other,” different perspectives integrate and become one. From a therapeutic standpoint, this transcendence is extremely valuable and the fear of this transcendence should—at least to some extent—be overcome. If movement of consciousness to other times is possible, hypothetically, speeding up the movement from a time of illness to a time of health may be as well.

This is yet another perspective from which the psychedelic class of drugs can be seen as candidates for facilitating psychotherapy and coping with illness. This potential is being explored in a number of new research projects reported primarily by the Multidisciplinary Association

for Psychedelic Studies (www.maps.org). As with so many applications, psychedelics await study by cognitive and clinical scientists with interest in gaining further insight into the function and applications of timelessness and other transition states and boundary conditions.

References

- Baruss, I., & Vletas, S. (2003). *Alterations of consciousness: An empirical analysis for social scientists*. Washington, DC: American Psychological Association.
- Dawson, K.A. (2001). A case study of space-time distortion during a total lunar eclipse following street use of LSD. *Journal of Psychoactive Drugs*, 33 (3), 301–305.
- Dawson, K.A. (2004). Temporal organization of the brain: Neurocognitive mechanisms and clinical implications. *Brain and Cognition*, 54, 75–94.
- Halpern, J.H. (2003). Hallucinogens: an update. *Current Psychiatry Reports*, 5, (5), 347–54.
- Hanes, K.R. (2001). Antidepressant effects of the herb *Salvia Divinorum*: a case report. *Journal of Clinical Psychopharmacology*, 21 (6), 634–635.
- Hanes, K.R. (2003). *Salvia Divinorum*: clinical and research potential. *MAPS*, 13 (1), 18–20.
- Health Canada (2004). *Advisory: Health Canada advises Canadians of stronger warnings for SSRIs and other newer anti-depressants*. Ottawa: Health Canada Online (http://www.hc-sc.gc.ca/english/protection/warnings/2004/2004_31.htm).
- May, R. (1958). Contributions of existential psychotherapy. In: R. May, E. Angel, & H.F. Ellenberger (Eds.), *Existence: A New Dimension in Psychiatry and Psychology*. New York: Basic Books.
- Melges, F.T., Tinklenberg, J.R., Hollister, L.E., & Gillespie, H.K. (1970). Marijuana and temporal disintegration. *Science*, 168, 1118–1120.
- Ornstein, R.E. (1972). *The Psychology of Consciousness*. New York: Viking Press.
- Ortega, A., Blount, J.F., & Marchand, P. (1982). Salvinorin, a new trans-neodeclerodane diterpene from *Salvia Divinorum* (Labiatae). *Journal of the Chemical Society, Perkin Transactions*, 1, 2505–8.
- Roth, B.L., Baner, K., Westkaemper, R., Siebert, D., Rice, K.C., Steinberg, S., Ernsberger, P., & Rothman, R.B. (2002). Salvinorin A: A potent naturally occurring nonnitrogenous K opioid selective agonist. *Proceedings of the National Academy of Sciences*, 99, (18), 11934–11939.
- Saniga, M., & Buccheri, R. (2003). *The psychopathological fabric of time (and space) and its underpinning pencil-borne geometries*. Internet URL: arXiv:physics/0310165v1, October 31.
- Siebert, D. (2004). *Salvinorin A: The breakthrough*. On the website of The *Salvia divinorum* Research and Information Center, accessed July 1, 2004 at URL: <http://www.sagewisdom.org/salvexpe.html>.
- Strassman R.J. (2001). *DMT: The spirit molecule*. Rochester, Vermont: Park Street Press.
- US Food and Drug Administration (2004). *Worsening depression and suicidality in patients being treated with antidepressant medications*. Washington, DC: FDA Public Health Advisory, March 22, 2004, US FDA, Center for Drug Evaluation and Research (<http://www.fda.gov/cder/drug/antidepressants/AntidepressantPHA.htm>).
- Valdes, L.J. (1995). *Salvia divinorum* and the unique diterpene hallucinogen, Salvinorin (Divinorin) A. *Journal of Psychoactive Drugs*, 26, (3), 277–283.
- Walsh SL, Strain EC, Abreu ME, & Bigelow GE. (2001). Enadoline, a selective kappa opioid agonist: comparison with butorphanol and hydromorphone in humans. *Psychopharmacology (Berl)*, 157, (2), 151–62.