TRIPLE GODDESS OF THE NIGHT

Anna Ger and Dmitri Ger

Despite being banned in the 1960s, open-minded scientists always saw the potential of using psychoactive compounds in neuroscience research. One of them, Alexandr Shulgin, inspired Anna and Dmitri to carry out the work described to Bulletin readers below.

What do we know about the application of psychoactive drugs in modern neuroscience? We believe that their potential is being overlooked. Partly, this is historic; psychoactive substances such as 5-HT receptor agonists (see glossary) stopped in the 1960’s after the US government announced that the nation was becoming addicted to LSD. Now, however, there is increasing interest in applying such substances to treat anxiety and depression. And we should not underestimate the potential benefit of using them in neuroscience research, too.

To make chemical synthesis more interesting, sophisticated and accessible, and help people see the beauty of chemistry art, we have linked synthesis of a new compound with Greek mythology. Selene, Hecate and Artemida are, in Greek mythology, goddesses of The Moon. Selene is the bright side while Hecate is the dark, chthonic side. Together, they are a complete whole - The Moon - but they are different sides of the same coin, antagonistic in nature.

While researching homologues of 2,5-Dimetoxy-4-methylphenylisopropylamine (DOM) Shulgin drew interesting analogies. There are nineteen hydrogen atoms in DOM. Nine hydrogen atoms are uniquely identifiable: they have strict spatial position in the molecule. The remaining ten atoms appear to be ‘duplicates’ of the unique nine (fig 1).

Shulgin decided to prove the uniqueness of each of the nine hydrogen positions by substituting each hydrogen for a methyl group in turn. As a result, nine new compounds were produced, which Shulgin then baptised with ten classical women’s names:

1. 1-(2,5-Dimethoxy-4-methylphenyl)-2-aminobutane – Ariadne
2. N-Methyl-1-(2,5-Dimethoxy-4-methylphenyl)-2-aminopropane – Beatrice
3. 1-(2,5-Dimethoxy-4-methylphenyl)-2-amino-2-methylpropane – Charmian
4. threo-1-(2,5-Dimethoxy-4-methylphenyl)-1-methyl-2-aminopropane - Daphne
5. erythro-1-(2,5-Dimethoxy-4-methylphenyl)-1-methyl-2-aminopropane – Elvira
6. 1-(2-Ethoxy-4-methyl-5-methoxyphenyl)-2-aminopropane – Florence
7. 1-(2,5-Dimethoxy-3,4-dimethylphenyl)-2-aminopropane – Ganesha
8. 1-(2,5-Dimethoxy-4-ethylphenyl)-2-aminopropane – Hecate
9. 1-(5-Ethoxy-4-methyl-2-methoxyphenyl)-2-aminopropane – Iris
10. 1-(2,5-Dimethoxy-4,6-dimethylphenyl)-2-aminopropane – Juno

Figure 1: 2,5-Dimetoxy-4-methylphenylisopropylamine (DOM)

Figure 2: Jelena
Hecate, the Greco-Roman goddess of the dark side of the moon, was often depicted as a three-faced figure and was associated with many things including protector of medicine and drug design.
But why are there ten compounds, and therefore ladies, when there are only nine unique hydrogens? Our suggestion is that Shulgin’s approach is not strictly scientific, but also creative. Ten compounds were produced because he put one substance in form of two optical forms of isomers: Daphne–Elvira. Probably he did it to keep beauty and balance, choosing to ignore that almost all these compounds (except Charmian) might be paired by optical isomers (doing so would be chaotic, not the “ten classical ladies” he aspired to create).

The real list, therefore, includes only nine compounds: Ariadne, Beatrice, Charmian, Daphne, Elvira, Florence, Ganesha, Hecate, Iris.

We decided it was time to re-establish the balance, and use our own methods to bring a tenth lady back to the group.

Our resultant new compound has an isopropyl ‘tail’ on the fourth position, making 1-(2,5-dimethoxy-4-isopropylphenyl)-2-aminoethane. This new tenth lady also happens to be structural isomer of all other nine ladies. Our tenth lady has never been mentioned anywhere as it never previously existed. We cannot keep our compound without a name. We got rid of Juno, and it will be logical to use J, so let us call it Jelena (fig 2).

Back to mythology. If Selene and Hecate are two antipodes of the Moon we could apply this to the chemistry and find an antipode of the Hecate molecule (Shulgin’s eighth lady). For this purpose let’s remove the methyl group from Hecate, the propyl ‘tail’, and place it on the opposite side: on the ethyl ‘tail’. As a result we have a compound which was mentioned in Shulgin’s “PIHKAL” as 2C-P. It would be logical to call 2C-P Selene as it is chemical analogue and contrast to Hecate.

In some sources Jelena is mentioned as the root of the name Selene, therefore Jelena is Selene’s derivative. Let’s apply some shamanism and turn Selene’s 4-propyl ‘tail’ into 4-isopropyl Jelena’s ‘tail’ - the new molecule is produced (Fig 3).

Try looking at psychoactive substances from another perspective; people perceived psychedelics as absolute evil but, by looking from a different point of view, they are now discovering the intrinsic usefulness and beauty of these substances. Hecate was always treated as a dark cursing goddess. Look closer and you will see the beauty of Selene and mystery of Jelena too.

It is worth mentioning that our work was also guided by Hecate; as protectress of medicine and drug design her presence is a benign blessing for much of today’s neuroscience research.

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