AUGUST STRINDBERG, GOLDBAKER

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Strindberg, the 'Shakespeare of the North', was obsessed with a passion for producing gold, and, like many alchemists before him, he failed to temper his imagination with reality. But his goldmaking 'research', like his other scientific studies, provides a valuable case study of a humanist genius whose amateur scientific activities enriched his literary and dramatic productions.

August Strindberg (1849-1912), Sweden's greatest writer and a follower of Haeckel and Darwin, believed in transmutation and sought a single origin for all matter, inanimate as well as animate [1-5]. Although, with a few exceptions [7-10], his scientific studies have been neglected compared to his dramatic and literary productions, several recent articles [11-16] seem to indicate an increasing interest by historians of science in this fascinating aspect of the work and thought of the 'Shakespeare of the North'. Strindberg's attempts to synthesize gold illustrate the differences between the experimental approach of a gifted amateur who happened to be a genius in his own field and that of a professional scientist. This article briefly considers one phase of his alchemical research – his attempts to synthesize gold from other elements – in terms of modern chemistry. It also will present the results of nondestructive analyses of eight of his 'gold samples'.

Fig. 1 August Strindberg

vinced that the examiners had a personal grudge against him. Thus his subsequent chemical research may have been consciously or subconsciously motivated by his need to vindicate himself in the eyes of 'establishment' scientists. Most of his experiments were crude, non-quantitative, and lacking in objectivity and proper scientific controls. His "uncontrolled subjectivity and inordinate need of self-personification", to use Martin Lamm's apt words, were traits of immense value to him as a playwright and novelist, but they militated against his success as a scientist. He worked impulsively and obsessively with a selective approach that seized upon 'evidence' apparently favoring his *idée fixe* of transmutation and the unity of matter, yet he dis-

regarded whatever observations did not support his hypothesis.

One of the primary requirements for a successful scientist is the ability to discriminate between significant observations and those which are merely random or coincidental. Strindberg, with his superstitious and paranoid personality, regarded all sorts of fortuitous events and experimental observations as pregnant with meaning or evidence of the action of *makterna* (the Powers) [17], which he believed had singled him out for special reward

Strindberg's Characteristics as a Scientist

As a scientist, Strindberg was largely self-taught. In 1869 he failed his preliminary examination in chemistry at Uppsala University and left Uppsala in a rage, con-

Strindberg's Interest in Gold

Like many alchemists before him, Strindberg was obsessed with a passion for producing gold that went beyond a consideration of its unique physical and chemical properties. In his holograph papers [28] is a quotation from Scene 1 of Richard Wagner's *Das Rheingold* describing the power of a ring forged from the gold guarded by the Rhinemaidens, showing that Strindberg was well aware of the mystique associated with the king of metals since antiquity:

Nur wer der Minne Macht entsagt,
Nur wer der Liebe Lust verjagt,
Nur der erzielt sich den Zauber,
Zum Reif zu zwingen das Gold.
(Woglinde)
... So verfluch' ich die Liebe!
(Alberich) [29]

Franklin S. Klaf, an American psychiatrist, thought that Strindberg's alchemical experiments provided an outlet for the paranoid hostility typical of schizophrenics [30]. In *Till Damaskus* (To Damascus) [31], the first of his dream plays, Strindberg revealed that gold-making fed his megalomaniacal feelings of grandiosity. He would be

a man who has done what no one else has ever done;
who will overthrow the Golden Calf and upset the
tables of the money changers. I will hold the fate of
the world in my crucible.

He proclaimed that transmutation of base metals into gold was intended not for accumulating wealth but as a calculated destructive act:

I'll do it to paralyze the present order, to disrupt it
as you'll see. I am the destroyer, the dissolver, the
world incendiary; and when all lies in ashes, I shall
wander hungrily through the heaps of ruins, rejoicing
at the thought that it is all my work: that I have
written the last page of world history, which can
then be held to be ended.

As a follower of Haeckel and Darwin, Strindberg believed that the number of elements was much fewer than generally believed and that many substances commonly thought to be elements were complex aggregates formed from simpler elements (e.g., hydrogen, carbon and oxygen) by a process similar to evolution among plants and animals. This belief in a single origin for all matter, which was within the realm of normative nineteenth-century chemistry and which coincidentally adumbrates our modern views of the constitution of matter as being composed of subatomic particles (protons, neutrons and

electrons), underlay his belief in transmutation. Gold, considered the most perfect of metals, was therefore potentially obtainable from less noble, base metals.

Strindberg's Works on Gold-making

Concern with gold appears not only in many of Strindberg's scientific studies but also in some of his literary and dramatic works. Among his general scientific works, those which deal with gold include *Antibarbarus* (1894) [32], *Introduction à une Chimie Unitaire* (1895) [33], *Typer och Prototyper inom Mineralalkemien* (1898) [34] and *En Blå Bok* (1907-1908) [35].

Gold is also frequently mentioned in his correspondence (1894-1902) with the Parisian alchemist François Jollivet Castelot (*Bréviaire Alchimique*, 1912) [36], in his *Ockulta Dagboken* (The Occult Diary) (1896-1908) [37], and in many of his letters [38]. But his most detailed directions for gold-making are found in a short article, *Synthèse d'Or* (Synthesis of Gold), in the Parisian journal *L'Hyperchimie* [39], in *Guldets syntes* (Synthesis of Gold) (1896) [40], *Nutidens guldmakeri* (Today's Gold-Making) (1896) [41], the article *Les Gîtes Aurifères de la France* (The Gold-Bearing Strata of France) [42] and the document *Livre d'Or* (Book of Gold) [43].

In Berlin during March 1894, together with his friend, the surgeon Carl Ludwig Schleich, Strindberg submitted to the chemist Hans Heinrich Landolt (1831-1910) and the pharmacologist Oscar Liebreich (1839-1908) some paper sheets speckled with 'gold', which he claimed to have made by transmutation, but the two University of Berlin professors were unimpressed [44]. This was only one of numerous occasions on which Strindberg showed or gave 'gold samples' to friends or relatives. His third wife, the Norwegian actress Harriet Bosse (1878-1961), to whom he confided his methods for producing 'gold', reported that "he took a much greater pride in his scientific discoveries than he did in being a great author" [45]. A number of Strindberg's 'gold samples' are preserved among Strindberg's papers at the library of Lunds Universitet (University of Lund) and Kungliga Biblioteket (The Royal Library), Stockholm.

Strindberg's *Synthèse d'Or*

Three relatively simple 'gold syntheses' by Strindberg appear in *L'Hyperchimie* [46] and are typical of his work and thought on this subject (Figure 3). They also appear in a number of his other published works. In my translation, which follows, my annotations and corrections to Strindberg's work appear in square parentheses:

Synthesis of Gold

Ammoniacal iron sulfate = $\text{Fe}(\text{AZH}^4)^2(\text{SO}^4)^2 6\text{aq} = 392$.

The molecule of gold = $\text{Au}^2 = 392$.

Perhaps the solution of the enigma:

Starting Point

Iron sulfate (green copperas) $[\text{FeSO}_4 \cdot 7\text{H}_2\text{O}]$ precipitates solutions of gold. According to monistic chemistry, to precipitate means to enter as a factor in the reconstitution of a decomposed substance.

Fundamental Experiment

A strip of paper is soaked in a solution of iron sulfate [and] held over the fumes from a bottle of ammonia. This paper is colored blue-green like gold protoxide $[\text{Au}_2\text{O}]$. It is dried above a lighted cigar, and the paper is colored maroon like gold deutoxide $[\text{Au}_2\text{O}_3]$. But gradually shining yellow scales of metallic gold are formed constituting an unfixed gold, when the iron sulfate produces a self-fertilization by being precipitated itself.

However, the shining yellow scales amalgamate with mercury. Therefore it is at least no longer iron, since iron does not amalgamate with mercury.

Nevertheless, the strips of paper are colored blue by yellow fer-

rocyanide $[\text{K}_4[\text{Fe}(\text{CN})_6]]$, which indicates the presence of iron, but at the same time of gold since yellow ferrocyanide produces Prussian blue $[\text{KFe}[\text{Fe}(\text{CN})_6]]$ with certain salts of gold.

Let us try to explain what happens in the fundamental experiment.

1). Either there is formed a hypothetical and unknown iron sulfide, $\text{Fe}^3\text{S} = 196 = \text{Au} = 196$ [actually 199.58].

Which is not probable when the yellow shining scales do not give hydrogen sulfide with acids as pyrites do. Which could be the case since gold accompanies pyrites.

2). Or there is formed an unknown hydrated iron oxide, $\text{Fe}^2\text{O}^3 + 2\text{H}^2\text{O} = 196 = \text{Au} = 196$.

Which could be likely when auriferous gravel are always ferruginous.

3). Or there is formed an ammoniacal iron sulfate: $\text{Fe}(\text{AZH}^4)^2(\text{SO}^4)^2 6\text{H}^2\text{O} = 392$. The number 392 indicates exactly the molecular weight of gold chloride = 392, which allows one to think, and gold chloride is reduced by the nicotine [of the cigar] reducing agent of gold salts.

What renders this last reaction probable? A fact drawn from the old chemistry.

Orfila has said: Ammoniacal iron trisulfate is produced by dissolving gold [?] in ammonium chloride and nitric acid and by precipitating it by iron sulfate.

To make use of a solution of gold in order to produce a simple compound of iron indicates an intimate relation between the constitution of gold and of iron.

Finally, this unfixed and incomplete gold dissolves in nitric acid alone and in hydrochloric acid, a property, however, in common with extremely attenuated gold.

Experiment II

The self-fertilization of iron has given a bad offspring, and it is necessary to cross this metal with another which possesses the more accentuated properties of gold.

Copper, belonging to the second group of metals, different from the first or that of iron by several qualities, already appears by nature to be designated as the female when chalcopyrites, combined sulfides of iron and copper, produce a more perfect gold than the simple sulfides of iron.

A strip of paper is soaked in cuprous chloride Cu^2Cl^2 $[\text{CuCl}]$, then soaked in iron sulfate and held over the fumes of ammonia and a cigar. This gold is more resistant and more lustrous.

The reaction could be explained as follows:

How is this cuprous chloride produced? By precipitating copper sulfate with tin chloride $[\text{SnCl}_2]$.

But tin chloride precipitates gold from its solutions. Thus copper sulfate appears to be endowed with the possibility of forming a gold.

This synthesis of gold is confirmed and verified for the procedure named after Falun, applied to the extraction of gold from chalcopyrites or combined sulfides of iron and copper. Two copper mines exist in Sweden where gold has always been extracted: Falun and Adelfors.

This is the procedure in the simplest form, corresponding exactly to the synthesis presented below.

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Synthèse d'Or

Sulfate de fer ammoniacal
 $= \text{Fe}(\text{AZH}^4)^2(\text{SO}^4)^2 6\text{aq} = 392$.
 La molécule de l'or = $\text{Au}^2 = 392$.
 Peut-être la solution de l'enigma :

Point de départ (*)
 Sulfate de fer (couperose verte) précipite les solutions d'or. Précipiter veut dire, d'après la chimie moniste, entrer comme facteur dans la reconstitution d'un corps décomposé.

Expérience fondamentale
 On trempe une bande de papier dans une solution de sulfate de fer : fume au dessus du flacon d'ammoniaque. Ce papier se colore en bleu-vert comme le protoxyde d'or. On fait sécher au dessus du cigare allumé, et le papier se colore en brun marron comme le deutoxyde d'or.

une autofécondation en se précipitant soi-même.

Cependant, les paillettes jaunes s'amalgament avec le mercure. Donc ce n'est pas plus du fer au moins, puisque le fer ne s'amalgame point avec le mercure.

Toutefois les bandes de papier se colorent en bleu avec le ferrocyanure jaune, ce qui indique la présence du fer, mais en même temps de l'or puisque le ferrocyanure jaune produit du Bleu de Prusse avec certains sels d'or.

Essayons d'expliquer ce qui se passe dans l'expérience fondamentale.

1^o Ou il se forme un sulfure de fer hypothétique et inconnu $\text{Fe}^3\text{S} = 196 = \text{Au} = 196$.

2^o Ce qui n'est pas probable. Lorsque les paillettes jaunes ne donnent pas hydrogène sulfuré avec les acides, comme les pyrites le font. Ce qui pourrait le cas,

Fig. 3 One of Strindberg's articles on the synthesis of gold was published in 1896 in L'Hyperchimie - a monthly review of alchemy and hermetism

Chalcopyrites are roasted with sodium chloride; iron chloride is formed $1\text{e } \text{Cl}^2 4\text{N}^2 \text{O} - 196 = \text{Au}$: $\text{ch } \text{Cu}^2 \text{Cl}^2 = 196$ [This should read ' $\text{FeCl}^2 + 4\text{H}^2 \text{O} = 196 = \text{Au}$ and $\text{Cu}^2 \text{Cl}^2 = 196$ '. Actually, the correct values are 198 and 198.75, respectively].

The ores are treated with calcium chloride and sulfuric (or hydrochloric) acid, whereby they become chlorinated. Then as a final step they are precipitated by iron sulfate. This is all, and it is exactly the operation mentioned here.

Experiment III

Simplified method for a large yield

In a bucket I pour 1 copper sulfate, 3 iron sulfate, 1 ammonium chloride, and ammonia at will. Then I fill the bucket with water and allow it to stand in the sun or in front of a fire.

On the surface of the water heavy specks appear after a few hours, or better, after a day of waiting. The heavy specks are recovered on paper and allowed to dry at leisure. On adding ammonia, the production continues for weeks.

Auguste Strindberg
Saxen near Grein, Upper Austria,
15 September 1896

Strindberg asked John Landin, an engineer, to analyze his 'gold samples'. Landin found them to consist of a mixture of iron(III) hydroxides and oxides as might be expected from Strindberg's procedures.

He published his analytical results [47], and Strindberg reacted angrily and publicly declared Landin's results to be erroneous [14, 48, 49].

Space limitations prevent my considering Strindberg's gold-making activities in more detail. For this the reader is referred elsewhere [50-55].

Modern Interpretations and Analyses

In attempts to reproduce Strindberg's results, I followed his directions, which was somewhat difficult since he gave few details and little in the way of quantities. In the 'Fundamental Experiment' the blue-green spot was undoubtedly unstable iron(II) hydroxide, which, on drying over a cigar, oxidized to form a brownish orange spot of iron(III) hydroxide, which could be construed as gold only by someone as imaginative and already convinced of the possibility of transmutation as Strindberg.

My results for 'Experiment II' were essentially the same. Copper(I) chloride is insoluble and probably had no effect on the reaction; any that did dissolve probably oxidized to copper(II) chloride.

My results for 'Experiment III' (3 g NH_4Cl , 3 g $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ and 9 g $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ dissolved in 600 ml of H_2O followed by addition of 5 ml of concentrated aqueous NH_3) were more successful. First, a shimmering film of orange-brown flakes resembling gold appeared on the sur-

Fig. 4 Some of Strindberg's 'gold samples' on paper preserved at the Kungliga Biblioteket in Stockholm

face of the liquid. This eventually settled to the bottom of the beaker as a muddy brown precipitate. The supernatant solution was colored deep purple by the stable tetraamminecopper(II) ion ($\text{Cu}(\text{NH}_3)_4^{2+}$).

Through the kindness of Prof. Levi Tansjö, Chairman of the Organic Chemistry Department, Lunds Universitet, and Margareta Brundin, Handskriftavdelningen, Kungliga Biblioteket, I was able to obtain analyses of some of Strindberg's 'gold samples' (impregnated paper) preserved at the two institutions. The samples looked much more like gold than those that I had prepared. The color reproduction (Figure 4) does not look nearly as much like gold as the actual samples.

Seven samples from Kungliga Biblioteket (4 from Sg NM 29, 2 from Sg NM 31 and 1 from Sg NM 37) were selected by Dr. Brundin, together with Prof. Lennart Bäckérud, Institute for Structural Chemistry, The Arrhenius Laboratory, Stockholms Universitet, under whose direction the analyses were carried out by his graduate student Mr. Rein Kiusalaas. The samples were analyzed qualitatively for metallic elements (atomic numbers > 11) in an X-ray fluorescence spectrometer using an end-window Rh anode tube for excitation of characteristic X-ray spectra. No gold was found in any of the samples except for one in which gold was used as a starting material. All the samples, however, contained iron in reasonable amounts or as a major component.

A 'gold sample' from Lunds Universitet Biblioteket was analyzed by Drs. Börje Folkesson and Ragnar Larsson of the Department of Inorganic Chemistry, Chemical Center, Lunds Universitet by ESCA (electronic spectra for chemical analysis), a technique capable of detecting as little as 100 μg of gold or as little as 0.58 μg of gold on the surface of the paper. They found that the sample contained

large amounts of iron and oxygen showing that the yellow material on the paper was probably iron(III) oxide, in agreement with John Landin's results obtained eighty-eight years earlier.

Conclusions

As we have seen, the scientific value of Strindberg's work on gold-making *per se*, like that of his other chemical and alchemical studies, is minimal. His undue emotional involvement and his mystical belief in analogies, correspondences and numbers resulted in an almost complete lack of objectivity in his experiments and theories. Svedberg concluded,

The value of Strindberg's chemical writings is wholly of a literary and psychological nature. Especially in the future they should be of extraordinary significance in judging his spiritual development also his scientific studies have undoubtedly fertilized his writing to a high degree, enriched it with new and fresh images, and in an unusual way have brought him into intimate contact with the world surrounding him [56].

In Evert Sprinchorn's words, "As a scientist, Strindberg was a superb poet" [57], while Gunnar Brandell stated, "In my book [*Strindbergs Infernokris* [58]] I chose to regard Strindberg's chemical speculations as a kind of poetry rather than science" [59]. Yet, despite their shortcomings, Strindberg's chemical and alchemical work found expression in his writing. Thus Strindberg's gold-making 'research', like his other scientific studies, provides a valuable case study of a humanist genius whose amateur scientific activities enriched his literary and dramatic productions.

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- 21 Strindberg's stay in Paris (August 1894 - Summer 1896) has become known as his Inferno Period or his Inferno Crisis (ref. 3, chap. 12; ref. 4, chap. 14; ref. 5), since it eventually culminated in his novel *Inferno*, written in Lund (3 May - 25 June, 1897) describing his conversion from a materialistic atheism to his own eclectic and mystical religion based on the tenets of the Swedish scientist, mystic and philosopher, Emmanuel Swedenborg (1688-

- 1722) and others. In Paris Strindberg turned his back on the literary world, abandoned his creative writing and obsessively pursued both theoretical and laboratory studies of the natural sciences (chemistry, botany and optics) and occult sciences (alchemy, theosophy, mesmerism, numerology and cabala) in an effort "to provide the link between science on the one side and occultism and religion on the other". He regarded his *Inferno* years, during which he experienced five acute psychotic episodes (ref. 5) as the most intense and exciting of his life, and they had such a profound influence on his artistic development that his literary works are commonly dichotomized as 'pre-Inferno' and 'post-Inferno'.
- 22 Strindberg's second wife, Frida Uhl (1872-1943) was a 19-year-old Austrian journalist with ambitions of becoming a writer when she met the celebrated 41-year-old playwright. Their marriage, which produced one daughter, lasted only a short time (2 May, 1893 - 19 Oct., 1897).
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