Review

Wood's light in dermatology

Pravit Asawanonda, MD, and Charles R. Taylor, MD

From the Department of Dermatology, Massachusetts General Hospital, Boston, Massachusetts

Correspondence
Charles R. Taylor, MD, Massachusetts General Hospital, 55 Fruit Street, BAR 410, Boston, MA 02114

Historical aspects

Wood's lamp was invented in 1903 by a Baltimore physicist, Robert W. Wood (1868–1955).[1] The familiar long-wave ultraviolet (UV) light, known as Wood's lamp, has become an invaluable tool in the practice of medicine. The first reported use of this lamp in dermatology occurred in 1925, being recommended for the detection of fungal infection of the hair.[2] Unlike many other medical devices, which have tended to lose their popularity over time, Wood's lamp has maintained its usefulness not only in dermatology, but also in ceramics where it can be used to determine repairs.

Wood's light physics

Wood's lamp's long-wave UV radiation (UVR) emission is generated by a high-pressure mercury arc fitted with a compounded filter made of barium silicate with 9% nickel oxide, the so-called "Wood's filter." This filter is opaque to all light except for a band between 320 and 400 nm with a peak at 365 nm. Fluorescence of tissue occurs when light of shorter wavelengths, in this case 340–400 nm, initially emitted by Wood's light, is absorbed and radiation of longer wavelengths, usually visible light, is emitted. The output of Wood's lamp is generally low. A typical Wood's lamp has an output of less than 1 mW/cm^2.

While both epidermal and dermal melanin absorb in this waveband, it is the collagen in the dermis which, upon absorption, fluoresces at longer visible wavelengths mainly in the blue range, thus resulting in the enhanced emission one looks for in using Wood's light. It must be remembered that, in general, the fluorescence of the skin is very poorly characterized. Fluorescence spectra of human skin appear to change with chronic sun exposure, perhaps due to alteration in dermal elastin.[3,4] Tissue autofluorescence appears to derive mainly from constituents of elastin (fluorophore unknown), collagen (pyridinoline crosslinks), aromatic amino acids (predominantly tryptophan and its oxidative products), nicotinamide adenine dinucleotide (NAD), and perhaps precursors or products of melanin.[5–7]

Technique

While the actual use of Wood's light requires minimal skill, the time needed to execute its proper use can be lost in today's busy clinics. Ideally, the lamp should be allowed to warm up for about 1 min. The examination room should be very dark. Black occlusive shades or a windowless room are preferred. It is also essential that the examiner becomes dark-adapted in order to see the contrasts clearly. Wood's light examination is notoriously unreliable in darker skin types as one needs low baseline levels of endogenous melanin to detect the subtle pigmentary contrasts enhanced by Wood's light-induced fluorescence. Another caveat is that the user needs to be aware of the possible fluorescence of topical medicaments, lint, and even soap residue.

The use of Wood's light in dermatology occurs predominantly in diagnostic areas involving pigmentary disorders, cutaneous infections, and the porphyrias. While its therapeutic uses remain minimal, some recent applications have involved adjunctive roles in various treatments. This review addresses the various applications of Wood's light in dermatology with a focus on clinical techniques, mechanisms, and limitations. The emphasis is on new, old, and forgotten applications with the intent of revitalizing respect and interest in this useful device.

Disorders of altered pigmentation

Hypopigmentation and depigmentation

Hypopigmentation or depigmentation in fair-skinned individuals can be very difficult to discern. In hypopigmented or depigmented lesions, there is less or no epidermal melanin. Consequently, there is a window through which the Wood's light-induced autofluorescence of dermal colla-

gen can be seen. Due to the abrupt cut-off in the visible emission from lesional skin, the margins of the hypopigmented or depigmented spots appear sharper under Wood's light. The lesions appear bright blue–white due to autofluorescence. Let us consider the examples of vitiligo, tuberous sclerosis, and hypomelanosis of Ito.

Vitiligo

Wood's light examination can help to locate and delineate vitiliginous patches which may be less obvious, especially in fair-skinned individuals. This procedure is essential in documenting an individual's baseline examination. The extent and distribution of the disease has an obvious bearing on therapeutic decisions. Those with extensive disease may give serious consideration towards permanent bleaching with monobenzyl ether of hydroquinone. Those with less involvement may choose repigmentation with photochemotherapy. While proper camera set-up is needed, in special circumstances UV photography is useful in documenting the extent of vitiliginous lesions as well as their response to treatment. Follicular repigmentation following oral photochemotherapy can be demonstrated earliest by the use of Wood's light.[8] Not only are Wood's lamps helpful in vitiligo, but also they have been useful for the detection of chemical-induced leukoderma[9] and leukoderma associated with melanoma.[10,11]

Tuberous sclerosis

A detailed skin examination is the most sensitive diagnostic test for the early detection of tuberous sclerosis.[12] Hypopigmented macules larger than 10 mm, especially those with a lance-ovate or ash-leaf shape, are the first skin findings in patients with tuberous sclerosis. Finding these lesions early on allows dermatologists to alert primary care physicians as to possible seizures or other clinical problems. Wood's light has clearly been shown to be beneficial in locating these lesions. With the exception of those lesions with the highly characteristic ash-leaf shape, the specificity of this test is not very high as Wood's light-positive hypopigmented macules with a variety of shapes are common skin findings in both the pediatric and adult populations.[13] The interpretation of Wood's light-positive skin lesions without neurologic findings therefore must always be performed cautiously. Each case must be decided on its own merits in conjunction with other clinical findings, a careful family history, and consultations with other providers.

Hypomelanosis of Ito

The characteristic cutaneous finding in hypomelanosis of Ito is whirled or streaked hypopigmentation, which, however, can be easily missed especially in fair-skinned individuals. When clinically in doubt, Wood's light examination can greatly help in delineating subtle hypopigmentation.[14] Given the sometimes argued, but generally agreed upon, association of hypomelanosis of Ito with central nervous system, ocular, and musculoskeletal anomalies, once again early detection via Wood's light examination seems prudent.

Hyperpigmentation

When incident light impinges upon the skin, photons of shorter wavelengths, especially UVB (290–320 nm) and UVA (320–400 nm), are more easily scattered by the stratum corneum and the epidermis. Contrarily, photons of longer wavelengths, such as the visible range (400–800 nm), penetrate more deeply into the dermis. Melanin absorbs light very strongly in both the UV and visible regions. When Wood's light is illuminated over a heavily melanized epidermis, most of its output is absorbed, while the less darkly pigmented adjacent skin scatters and reflects light as usual, resulting in enhanced contrasts at the border zone between areas of differing melanization. Variations in epidermal pigmentation thus become more apparent under Wood's light than under ordinary room light. For dermal pigmentation, this contrast is less apparent under Wood's light[15] because some of the autofluorescence of the dermal collagen takes place both above and below the dermal melanin, which serves to diminish the amount of fluorescence returned to the eyes.

Melasma

Sanchez *et al.*[16] reported the use of Wood's light in determining whether melasma is predominantly epidermal or dermal. Epidermal-type melasma shows enhancement of color contrast when examined under Wood's light as compared to visible light. Conversely, melasma of dermal type, which may have a slight bluish hue in natural sunlight, does not demonstrate such contrast enhancement when seen under Wood's light. The authors classified melasma according to their Wood's light findings into four different types: epidermal, dermal, mixed, and Wood's light inapparent. Patients with mixed-type melasma showed color enhancement in some areas, but not in others. Melasma in patients with darker complexions (skin types V and VI) was more evident in visible light than under UV light, hence the Wood's light inapparent type. The pathology in this latter group of patients was consistent with dermal-type melasma. The location of pigmentation was confirmed histologically. Wood's light may serve an important therapeutic and prognostic function for cases of melasma, as those involving predominantly epidermal melanin may well respond more favorably to bleaching agents and other topical remedies.

Infections

Bacterial

Pseudomonas

Wood's light examination allows early detection of *Pseudomonas* skin infections, especially in burn wounds. Pathogenic forms of *Pseudomonas* produce a pigment known as pyoverdin or fluorescein which shows green fluorescence under Wood's light. Fluorescence is detected when the bacterial count approaches $10^5/cm^2$, the number required for infection.[17] Prompt detection, of course, allows for immediate treatment for this potentially serious infection. Both false positive and false negative rates have been demonstrated to be rather low.[18] In ecthyma gangrenosum, for example, saline can be injected into the wound and then withdrawn. The solution obtained often shows positive fluorescence under Wood's light in a dark room, thus potentially pointing towards *Pseudomonas* sepsis many hours ahead of confirmatory blood culture results. Wood's light examination is also useful in other forms of cutaneous *Pseudomonas* infections, including folliculitis, which tends to occur after immersion in swimming pools, hot tubs, or whirlpools,[19] and toe web infection.[20] One caveat is that, if the patient has cleansed the area recently, fluorescence may not be detected due to the dilution effect.

Erythrasma

Erythrasma is a skin infection which may or may not be itchy. It is caused by *Corynebacterium minutissimum*, which shows coral-red fluorescence upon Wood's light examination from porphyrins produced by the organisms.[8] This cutaneous infection is most common in the groin area, and many individuals have some involvement in the bilateral fourth web spaces of the feet. By identifying the unique fluorescence pattern, the provider can select the appropriate antibiotics more readily, thus avoiding delays in diagnosis.

Propionibacterium acnes

It has long been known that orange–red fluorescence can be seen within comedones on the face (Fig. 1). The nature of this fluorescing compound was unknown until Cornelius and Ludwig[21] demonstrated that it was indeed a porphyrin. Coproporphyrin is the major porphyrin produced by *P. acnes*,[21,22] while protoporphyrin IX is produced to a lesser extent.[21] In fact, for actinic folliculitis, it is presumed that sunlight activates these porphyrins with resultant follicular damage. Facial follicular fluorescence correlates well with the *P. acnes* populations.[22] Johnsson *et al.*[23] obtained contents of pilosebaceous follicles from individuals with and without acne lesions and studied the emission and excitation spectra of the material. They also concluded that the spectra were similar to that of *P. acnes*. Wood's light examination of the face can be useful in patients who fail to respond to oral antibiotics. Comedones often show yellowish-white fluorescence due to compacted keratin (Fig. 2).

Fungal

Dermatophytes

Wood's light examination of the glabrous skin, nails, palms, and soles is generally not helpful in the diagnosis of true dermatophyte infections due to the lack of fluorescence. Conversely, it is particularly useful in the diagnosis of tinea capitis. The characteristic fluorescence is typically seen in the broken-off hairs and in the intrafollicular portion when the hair is plucked.[24] Bright-green fluorescence is seen in *Microsporum audouinii* and *M. canis* infections[25] (Table 1) *M. distortum*, *M. ferrugineum*, and *M. gypseum* also fluoresce. Similarly, *Trichophyton schoenleinii*, the cause of favus, fluoresces a faint blue color. *T. tonsurans* and *T. verrucosum* do not produce fluorescence upon Wood's light examination. With the exception of *T. schoenleinii*, dermatophytes causing fluorescence are generally members of the *Microsporum* genus. The fluorescence of these infected hairs indicates the presence of infection, but does not generally differentiate the causative organisms, except for the hints gleaned by the subtle differences in fluorescence color. The chemical responsible for positive fluorescence is a pteridine.[26] False positive findings include lint, which appears bright white, scales, ointments, and dried soap.

Tinea versicolor

Wood's light examination is very helpful in determining the extent of infection by *Malassezia furfur*. Yellowish-white or copper-orange fluorescence can be observed in active infections.[8] Jillson[8] felt that Wood's light is particularly useful in diagnosing the follicular form of this infection in which bluish-white fluorescence may be observed in the follicles. The author's original description best fits the modern day term *Pityrosporum* folliculitis for which Wood's light can be used to distinguish from other types of folliculitis.

Disorders of porphyrin metabolism

Wood's light examination is particularly useful in the diagnosis of the porphyrias as, depending on the disease, the Wood's light user can detect excess porphyrins in teeth, urine, stool samples, and blood (Table 2). In porphyria cutanea tarda, for example, the urine from affected patients shows a bright, pink–orange color when fluorescing under Wood's lamp. This reaction can be accentuated by adding an equal volume of 1.5 N HCl to the test tube. Samples from liver biopsies will also show fluorescence in this

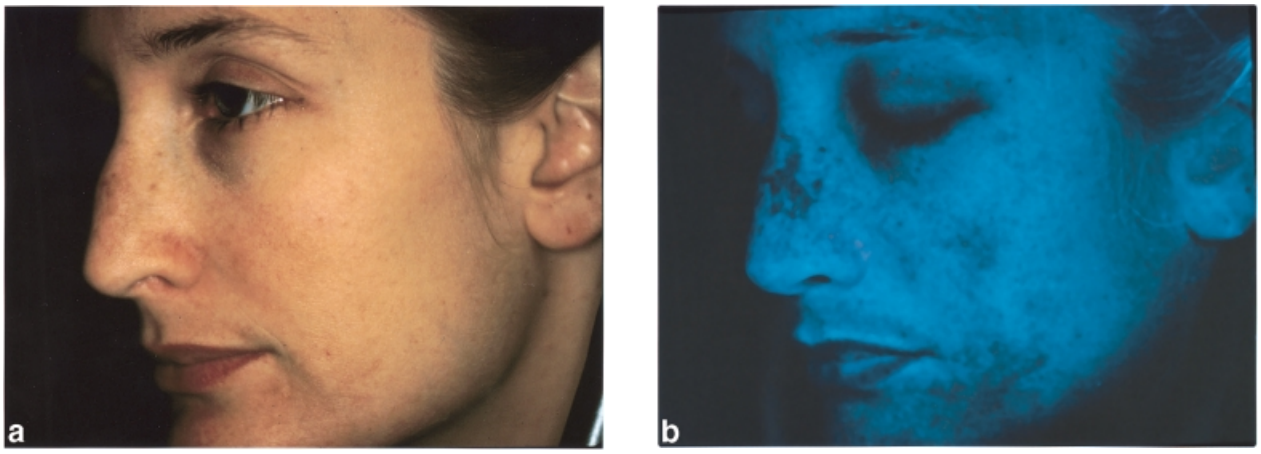

Figure 1 (a) Clinical photograph of a subject taken with ordinary light. (b) The same subject photographed with a UV fluorescence camera. Note the accentuation of pigmentary lesions otherwise inconspicuous under room light. Also remarkable is the orange–red fluorescence due to porphyrins produced by bacteria observed within hair follicles in the nasolabial fold

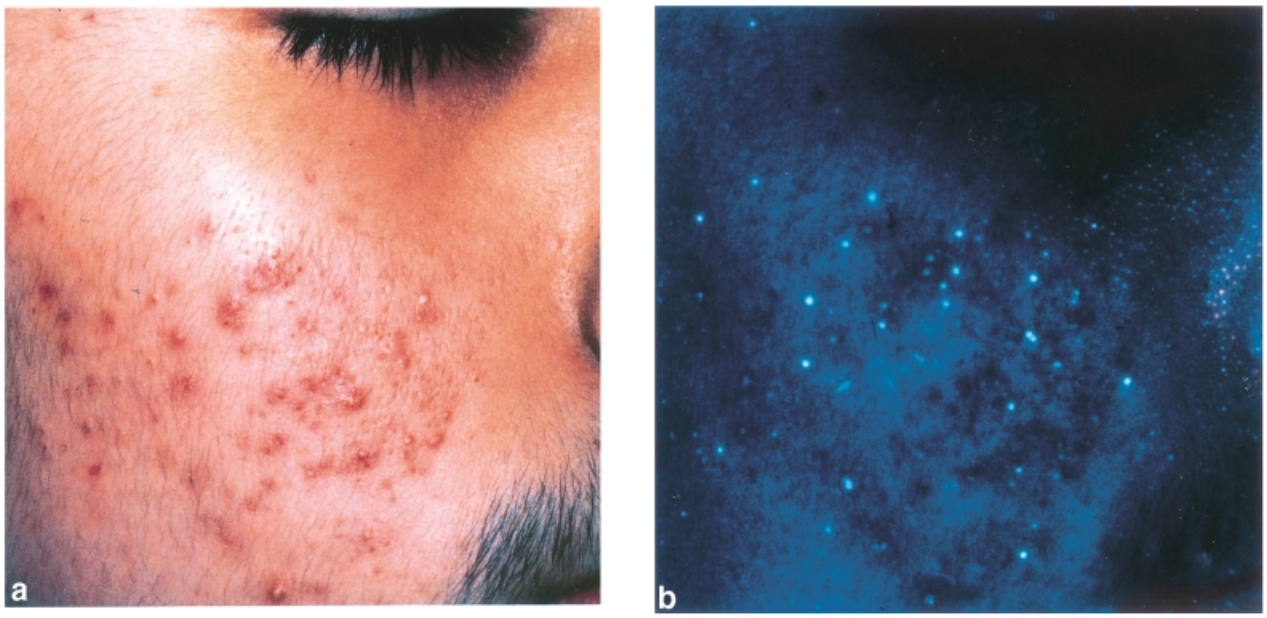

Figure 2 (a) Clinical photograph taken with ordinary light and showing an acne vulgaris patient with both inflammatory lesions and comedones. (b) The same subject taken under Wood's light showing yellowish-white fluorescence within the comedonal lesions. The absence of porphyrin fluorescence is the result of partial response to treatment

condition due to the accumulation of porphyrins within the liver cells. In variegate porphyria, the urine fluoresces in an acute crisis, while the stool fluoresces even during periods of remission. Stool samples should be mixed with equal parts of amyl alcohol, glacial acetic acid, and ether for best results. The teeth, urine, and bone marrow fluoresce red in congenital porphyria or Gunther's disease. In erythropoietic protoporphyria, the red blood cells transiently fluoresce under fluorescence microscopy, while the urine does not.[27] Alternatively, a biochemical screening test employing a mixture of ether, glacial acetic acid, and hydrochloric acid can also be performed.[28] An excess of protoporphyrin and coproporphyrin in erythropoietic protoporphyria results in an intense red fluorescence.[28] Erythrocyte protoporphyrin may also be above normal levels in lead poisoning and anemic states;[28] however,

Table 1 Characteristic fluorescence of dermatophytes

Organism	Color of fluorescence
Microsporum audouinii	Blue–green
M. canis	Blue–green
M. ferrugineum	Blue–green
M. distortum	Blue–green
M. gypseum (some variants)	Dull yellow
Trichophyton schoenleinii	Dull blue

Table 2 Characteristic fluorescence observed in the principal porphyrias

Diagnosis	Sample	Color of fluorescence
Erythropoietic porphyria	RBC, urine, teeth	Red–pink
Erythropoietic protoporphyria	RBC, feces, gall stones	Red–pink
Hepatoerythropoietic porphyria	RBC, feces, urine	Red–pink
Porphyria cutanea tarda	Urine, feces	Red–pink
Variegate porphyria	Urine, feces	Red–pink

RBC, red blood cells.

photosensitivity does not occur in these two conditions. Metabolites accumulated in acute intermittent porphyria (δ-aminolevulinic acid (δ-ALA) and porphobilinogen) have not yet become porphyrins and thus fluorescence is not observed in this condition.[24,27]

Phototesting

Jillson[8] reported the use of Wood's light in photopatch tesing when other higher output UVA sources were not available. Due to its rather low output, the Wood's lamp is not recommended for photopatch testing by the British Photodermatology Group.[29] Irradiation times needed to deliver the 10 J/cm^2 can easily exceed 2 h.

Miscellaneous uses

Chemical peeling

Matarasso *et al.*[30] reported that, by adding salicylic acid (at a ratio of 1 : 5) or fluorescein sodium (ratio 1 : 15) to 20% trichloroacetic acid or 70% glycolic acid, fluorescence can be observed during the time of a chemical peel. Upon Wood's light illumination, salicylic acid yields green fluorescence, while fluorescein fluoresces yellow–orange. The authors assert that this technique helps to avoid overcoating of the solution and ensures that all areas are treated evenly.[30]

Lawrence *et al.*[31] reported the use of Wood's light to predict the outcomes of Jessner's and 70% glycolic acid peels for melasma. Given that epidermal melasma, which theoretically demonstrates contrast enhancement when examined by Wood's light, should respond more readily to topical treatments and chemical peels, the authors hoped they could identify a subset of patients more likely to respond to these peels. In their series, contrast enhancement was observed in 12 out of 16 patients; however, patients with contrast enhancement paradoxically did not fare better than patients who did not show such enhancement. It was hypothesized that this finding could best be explained by assuming that mixed-type melasma, which also shows at least some contrast enhancement, may be more common than previously thought.[31]

Detection of semen on the skin

A little known and potentially useful fact is that semen on the skin shows fluorescence when examined by Wood's light. This fluorescence may be negative or appear very faint after 28 h and the color of the fluorescence is similar to that of urine. While Wood's light examination is not diagnostic for sexual abuse in any regard, it may help the medical examiner locate areas where semen might have been present, thus directing careful swabbing towards potentially higher yield areas so that more sensitive laboratory techniques can be performed.[32]

Fluorescence from medications

Topically applied tetracycline hydrochloride demonstrates a coral red fluorescence which changes to yellow after a few minutes under Wood's lamp examination. This knowledge has proved useful for studying the transfer of topically applied medications to other body sites.[33] The yellow fluorescence of the lunulae[34] and the nails[35] has also been observed in patients taking oral tetracycline. This fact can be helpful in distinguishing tetracycline-induced nail pigmentation from other causes of yellow nails.[34] Interestingly, however, quinacrine hydrochloride (Atabrine) also results in yellow–green nail fluorescence.[36] While little used in this way, Wood's light could be helpful in monitoring the compliance of patients taking such oral agents. Wood's lamp examination of the skin normally yields a negative finding.[34,37]

To monitor the effectiveness of topical applications

Protective creams are useful for factory workers when gloves cannot be used. Recently, Wigger-Alberti *et al.*[38] reported the usefulness of Wood's light examination to monitor how workers apply protective creams to their hands. In this study, 1% vitamin A acetate was added to the cream in order to obtain fluorescence when examined with Wood's light. Their study confirmed that there were

skip areas on which protective creams were not applied. These areas correlated with sites where irritant contact dermatitis usually developed. Recently, Gaughan and Padilla[39] reported the use of fluorescent dye and UV photography to evaluate the adequacy of sunscreen application. In their report, several sites on the head and neck area were neglected or the sunscreen was improperly applied. Unfortunately, subjects with a known history of skin cancer or who were of fair skin types did not fully understand their risk and applied sunscreen inadequately. The use of this method for both applications is very helpful in educating people about common mistakes.

Therapeutic use

Wood's lamp has also been used occasionally as a powerfully suggestive placebo treatment for warts in pediatric patients. While warts are well known to undergo spontaneous remission, the use of Wood's light in this manner is otherwise harmless and painless.[40]

Photodynamic diagnosis

The recent development of photodynamic therapy of cancers has emphasized a long-standing clinical need to quantify concentrations of cytotoxic drugs. Based on the fact that δ-ALA-derived porphyrins preferentially accumulate in neoplastic tissues, Fritsch *et al.*[41] reported the use of topical δ-ALA and Wood's lamp to delineate the margin of recurrent basal cell carcinomas. 20% ALA ointment was applied to the tumor and left on for 4–6 h under occlusion allowing protoporphyrinogen IX to accumulate, after which the area was illuminated with Wood's light. The tumor emitted bright-red fluorescence. These fluorescence-positive areas proved to be basal cell carcinomas on histologic examination. This photodynamic diagnosis has proved useful in other conditions, including solar keratosis,[42] Bowen's disease, squamous cell carcinoma,[43] and extramammary Paget's disease.[44] This technique, when perfected, will be of great help to physicians taking care of skin cancers. It seems likely that additional specific, noninvasive, and useful optical techniques will be developed in the next decade.

Conclusions

Wood's lamps are small, durable, inexpensive, safe, and very easy to use. The greatest use lies in the detection and classification of sometimes subtle pigmentary conditions, together with the detection of dermatophyte and excess porphyrin fluorescence. They also provide quick results which can be quite valuable in certain situations such as burn wound infection. Their use seems to have broadened slightly over time as both diagnostic and investigational tools. In short, the great utility of Wood's light stems from its ease of use, confirming the dictum that simple, helpful devices in medicine endure.

References

1 Wood RW. Secret communications concerning light rays. *J Physiol* 1919; 5^e^ **serie:** t IX.
2 Margarot J, Devèze P. Aspect de quelques dermatoses en lumière ultraparaviolette. Note préliminaire. *Bull Soc Sci Med Biol Montpellier* 1925; **6:** 375–378.
3 Leffell DJ, Stetz ML, Milstone LM, Deckelbaum LI. In vivo fluorescence of human skin. A potential marker of photoaging. *Arch Dermatol* 1988; **124:** 1514–1518.
4 Anderson RR. In vivo fluorescence of human skin. A potential marker of photoaging (letter). *Arch Dermatol* 1989; **125:** 999–1000.
5 Fellner MJ, Chen AS, Mont M, *et al.* Patterns and intensity of autofluorescence and its relation to melanin in human epidermis and hair. *Int J Dermatol* 1979; **18:** 722–730.
6 Mustakallio KK, Korhonen P. Monochromatic ultraviolet-photography in dermatology. *J Invest Dermatol* 1966; **47:** 351–356.
7 Fulton JE Jr. Utilizing the ultraviolet (UV Detect) camera to enhance the appearance of photodamage and other skin conditions. *Dermatol Surg* 1997; **23:** 163–169.
8 Jillson OF. Wood's light: an incredibly important diagnostic tool. *Cutis* 1981; **28:** 620–626.
9 O'Sullivan JJ, Stevenson CJ. Screening for occupational vitiligo in workers exposed to hydroquinone monomethyl ether and to paratertiary-amyl-phenol. *Br J Ind Med* 1981; **38:** 381–383.
10 Goldman L, Wilson RG, Glasgow R, Richfield R. Perilesional leucoderma in metastatic melanoma. The use of the Wood's light for early detection of this rare reaction. *Acta Derm-Venereol* 1967; **47:** 369–372.
11 Koh HK, Sober AJ, Nakagawa H, *et al.* Malignant melanoma and vitiligo-like leukoderma: an electron microscopic study. *J Am Acad Dermatol* 1983; **9:** 696–708.
12 Cassidy SB, Pagon RA, Pepin M, Blumhagen JD. Family studies in tuberous sclerosis. Evaluation of apparently unaffected parents. *JAMA* 1983; **249:** 1302–1304.
13 Norio R, Oksanen T, Rantanen J. Hypopigmented skin alterations resembling tuberous sclerosis in normal skin. *J Med Genet* 1996; **33:** 184–186.
14 Ardinger HH, Bell WE. Hypomelanosis of Ito. Wood's light and magnetic resonance imaging as diagnostic measures. *Arch Neurol* 1986; **43:** 848–850.
15 Gilchrest BA, Fitzpatrick TB, Anderson RR, Parrish JA. Localization of melanin pigmentation in the skin with Wood's lamp. *Br J Dermatol* 1977; **96:** 245–248.
16 Sanchez NP, Pathak MA, Sato S, *et al.* Melasma: a clinical, light microscopic, ultrastructural, and immunofluorescence study. *J Am Acad Dermatol* 1981; **4:** 698–710.

17 Ward CG, Clarkson JG, Taplin D, Polk HC. Wood's light fluorescence and *Pseudomonas* burn wound infection. *JAMA* 1967; **202:** 27–28.
18 Polk HC, Ward CG, Clarkson JG, Taplin D. Early detection of *Pseudomonas* burn infection. Clinical experience with Wood's light fluorescence. *Arch Surg* 1969; **98:** 292–295.
19 Amichai B, Finkelstein E, Halevy S. Early detection of *Pseudomonas* infection using a Wood's lamp (letter). *Clin Exp Dermatol* 1994; **19:** 449.
20 Westmoreland TA, Ross VE, Yeager JK. *Pseudomonas* toe web infection. *Cutis* 1992; **49:** 185–186.
21 Cornelius CE, Ludwig GD. Red fluorescence of comedones: production of porphyrins by *Corynebacterium acnes*. *J Invest Dermatol* 1967; **49:** 368–370.
22 McGinley KJ, Webster GF, Leyden JJ. Facial follicular porphyrin fluorescence: correlation with age and density of *Propionibacterium acnes*. *Br J Dermatol* 1980; **102:** 437–441.
23 Johnsson A, Kjeldstad B, Melø TB. Fluorescence from pilosebaceous follicles. *Arch Dermatol Res* 1987; **279:** 190–193.
24 Krull EA, Babel DE. Diagnostic procedures of the skin. Part one. *J Fam Prac* 1976; **3:** 309–312.
25 Halprin KM. Diagnosis with Wood's light. Tinea capitis and erythrasma. *JAMA* 1967; **199:** 177.
26 Wolf FT. Chemical nature of the fluorescent pigment produced in *Microsporum*-infected hair. *Nature* 1957; **180:** 860–861.
27 Halprin KM. Diagnosis with Wood's light. The porphyrias. *JAMA* 1967; **200:** 130.
28 Rimington C, Cripps DJ. Biochemical and fluorescence-microscopy screening-tests for erythropoietic protoporphyria. *Lancet* 1965; **1:** 624–626.
29 British Photodermatology Group. Workshop Report. Photopatch testing—methods and indications. *Br J Dermatol* 1997; **136:** 371–376.
30 Matarasso SL, Glogau RG, Markey AC. Wood's lamp for superficial chemical peels. *J Am Acad Dermatol* 1994; **30:** 988–992.
31 Lawrence N, Cox SE, Brody HJ. Treatment of melasma with Jessner's solution versus glycolic acid: a comparison of clinical efficacy and evaluation of the predictive ability of Wood's light examination. *J Am Acad Dermatol* 1997; **36:** 589–593.
32 Gabby T, Winkleby MA, Boyce T, *et al*. Sexual abuse of children. The detection of semen on the skin. *Am J Dis Child* 1992; **146:** 700–703.
33 Johnson R, Nusbaum BP, Horwitz SN, Frost P. Transfer of topically applied tetracycline in various vehicles. *Arch Dermatol* 1983; **119:** 660–663.
34 Hendricks AA. Yellow lunulae with fluorescence after tetracycline therapy. *Arch Dermatol* 1980; **116:** 438–440.
35 Douglas AC. The deposition of tetracycline in human nails and teeth: a complication of long-term treatment. *Br J Dis Chest* 1963; **57:** 44–47.
36 Kierland RR, Sheard C, Mason HL, Lobitz WC. Fluorescence of nails from quinacrine hydrochloride. *JAMA* 1946; **131:** 809–810.
37 Czernielewski A, Skwarczynska-Banys E. Oral treatment of acne vulgaris and oil acne with tetracycline. *Dermatologica* 1982; **165:** 62–65.
38 Wigger-Alberti W, Maraffio B, Wernli M, Elsner P. Training workers at risk for occupational contact dermatitis in the application of protective creams: efficacy of a fluorescence technique. *Dermatol* 1997; **195:** 129–133.
39 Gaughan MD, Padilla RS. Use of a topical fluorescent dye to evaluate effectiveness of sunscreen application. *Arch Dermatol* 1998; **134:** 515–517.
40 Caplan RM. Medical uses of the Wood's lamp. *JAMA* 1967; **202:** 123–126.
41 Fritsch C, Becker-Wegerich PM, Menke H, *et al*. Successful surgery of multiple recurrent basal cell carcinomas guided by photodynamic diagnosis. *Aesth Plast Surg* 1997; **21:** 437–439.
42 Fritsch C, Stege H, Saalmann G, *et al*. Green light is effective and less painful than red light in photodynamic therapy of facial solar keratoses. *Photodermatol Photoimmunol Photomed* 1997; **13:** 181–185.
43 Fritsch C, Goerz G, Ruzicka T. Photodynamic therapy in dermatology. *Arch Dermatol* 1998; **134:** 207–214.
44 Becker-Wegerich PM, Fritsch C, Schulte KW, *et al*. Carbon dioxide laser treatment of extramammary Paget's disease guided by photodynamic diagnosis. *Br J Dermatol* 1998; **138:** 169–172.


GRANULAR EFFERVESCENT SALINE,
COMMONLY KNOWN AS
CITRATE OF MAGNESIA.
H. J. MANFULL,
The Meadows Drug Stores,
88, ARKWRIGHT STREET, NOTTINGHAM.

From the collection of Lawrence Charles Parish, MD, Philadelphia, Pennsylvania.