greatest curative and is a powerful germicidal agent. A critical review of the literature, however, discloses that artificial ultra-violet radiation has little importance in air conditioning, at least for the time being, because it is not known which of the solar rays brings about the cure, and what physiologic processes are involved in their action. With the exception of rickets and certain skin diseases, artificial radiation was found to have no effect on susceptibility, incidence, and resistance to respiratory infections[33], no permanent effects on blood and no effect on the general metabolism of human beings.

Ionization, on the other hand, seems to offer a fruitful field for research.

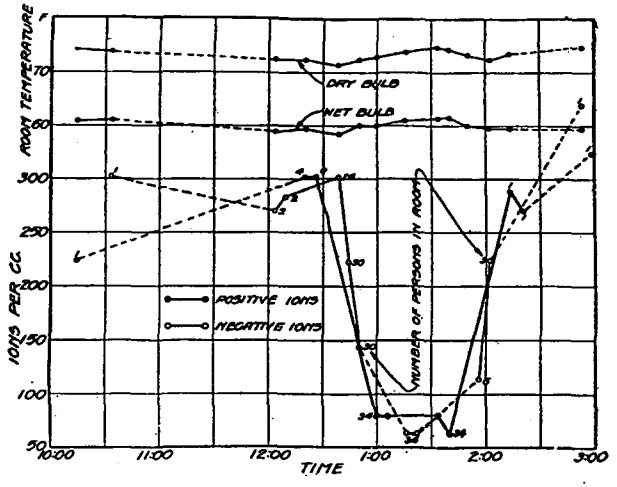

FIG. 3. INFLUENCE OF ROOM OCCUPANCY ON IONIC CONTENT[34]

(Cubical Contents of Room, 10,000 Cu Ft; Number of Occupants, 34)

Recent experiments[34] show that in occupied rooms there is a marked decrease in both positive and negative small ions. As shown in Fig. 3, soon after the occupants assembled the ionic content fell abruptly to a very low level which was maintained until the occupants left the room. Both positive and negative ions began to rise again as soon as the occupants departed. The problem now is to determine whether such alterations in the electrical quality of air have any significant bearing on comfort and health. If this proves to be the case, some artificial source of ionization may be desirable in occupied rooms.

[33]Light—Its Photodynamic Activity and Use as a Therapeutic Agent, by F. W. Schultz, K. W. Stenstrom and E. M. Clausen (Report of the White House Conference on Child Health and Protection, Washington, February, 1931).

[34]A.S.H.V.E. research paper entitled, Changes in Ionic Content in Occupied Rooms, Ventilated by Natural and Mechanical Methods, by C. P. Yaglou, L. C. Benjamin and S. P. Choate (A.S.H.V.E. TRANSACTIONS, Vol. 37, 1931). Physiologic Changes During Exposure to Ionized Air, by C. P. Yaglou, A. D. Brandt and L. C. Benjamin (A.S.H.V.E. Journal Section, *Heating, Piping and Air Conditioning*, August, 1933). Diurnal and Seasonal Variations in the Small Ion Content of Outdoor and Indoor Air, by C. P. Yaglou and L. C. Benjamin, (A.S.H.V.E. Journal Section, *Heating, Piping and Air Conditioning*, January, 1934).

HEAT AND MOISTURE LOSSES

In order to solve air conditioning problems involving the human body it is necessary to know the rate at which sensible and latent heat are given up by the body under various conditions of temperature and activity. Research at the A.S.H.V.E. Laboratory[35] has resulted in the data given in Figs. 4, 5, 6 and 7. Table 3 gives the metabolic rates for various degrees of activity.

The experimental data from which the curves were drawn indicate that

TABLE 3. RELATION BETWEEN METABOLIC RATE AND ACTIVITY[35]

ACTIVITY	METABOLIC RATE BTU PER HOUR FOR AVERAGE MAN (19.5 SQ FT SURFACE AREA)	AUTHORITY
Seated at rest	384	Research Laboratory, American Society of Heating and Ventilating Engineers.
Standing at rest	431	Research Laboratory, American Society of Heating and Ventilating Engineers.
Walking 2 mph	761	Average values from Douglas, Haldane, Henderson and Schneider; and Henderson and Haggard.
Walking 3 mph	1049	Douglas, Haldane, Henderson and Schneider
Walking 4 mph	1388	Average values from Douglas, Haldane, Henderson and Schneider; and Henderson and Haggard.
Walking 5 mph	2530	Douglas, Haldane, Henderson and Schneider
Slow run	2285	Henderson and Haggard
Very severe exercise	2555	Benedict and Carpenter
Maximum exertion	3333 to 4762+	Henderson and Haggard
Tailor	482	Becker and Hamalainen
Bookbinder	626	Becker and Hamalainen
Shoemaker	661	Becker and Hamalainen
Carpenter	762 to 963	Becker and Hamalainen
Metal Worker	862	Becker and Hamalainen
Painter (of furniture)	876	Becker and Hamalainen
Stonemason	1488	Becker and Hamalainen
Man sawing wood	1797	Becker and Hamalainen

total heat loss does not vary appreciably within the comfort zone range (see Fig. 4). Above or below this range the variation seems to be approximately a function of effective temperature. Sensible and latent heat losses (Figs. 5 and 7) on the other hand, vary greatly within the comfort zone range, the variation following more closely the dry-bulb temperature than any other factor.

Although total heat loss and sensible and latent heat losses are not exact functions of effective and dry-bulb temperature, respectively, for all conditions of humidity and air motion, they are plotted as such in the curves. This is accomplished by approximations which are sufficiently accurate for application to practical problems.

An atmospheric condition resulting in sensible perspiration is to be

[35]See A.S.H.V.E. research paper entitled Heat and Moisture Losses from Men at Work and Application to Air Conditioning Problems, by F. C. Houghten, W. W. Teague, W. E. Miller and W. P. Yant (A.S.H.V.E. TRANSACTIONS, Vol. 37, 1931).